

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

In the Matter of)	
)	
Unlicensed Use of the 6 GHz Band)	ET Docket No. 18-295
)	
Expanding Flexible Use in Mid-Band)	GN Docket No. 17-183
Spectrum Between 3.7 and 24 GHz)	

**COMMENTS OF
NCTA – THE INTERNET & TELEVISION ASSOCIATION**

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INTRODUCTION AND SUMMARY

This proceeding¹ presents the Commission with the opportunity to implement careful solutions to enable additional uses of spectrum, while protecting consumers' use of existing services in bands in which there are intensive incumbent operations. Specifically, provided that incumbent operations including C-Band Fixed Satellite Services (FSS) uplink (C-Band uplink), Broadcast Auxiliary Services (BAS), and Low Power Auxiliary Stations (LPAS) can be fully protected and assured ongoing availability and capacity commensurate with future demand, NCTA – The Internet & Television Association (NCTA)² supports the Commission's proposals to make 1200 megahertz of spectrum in the 5.925-7.125 GHz (6 GHz) band available for unlicensed use.

¹ *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, ET Docket No. 18-295, GN Docket No. 17-183, FCC 18-147 (rel. Oct. 24, 2018) (*Notice*).

² NCTA is the principal trade association of the cable television industry in the United States, representing cable television operators, programmers, and equipment manufacturers. The cable industry is a leading provider of residential broadband service to U.S. households and has invested more than \$290 billion over the last two decades to deploy and continually upgrade networks and other infrastructure – including building some of the nation's largest Wi-Fi networks.

Unlicensed devices using Wi-Fi and other standards play an “indispensable” role in Americans’ lives, and can help close the digital divide and maintain U.S. leadership in the next generation of wireless services.³ Today, Wi-Fi is the primary technology through which American consumers and businesses access the Internet. Wi-Fi is also central to consumers’ everyday lives, delivering critical services like healthcare monitoring and smart farming; connectivity for hospitals, universities, military bases, and other large institutions in urban, suburban and rural communities; as well as billions of dollars in secure financial transactions. But growing consumer demand, increased use of wide, high-bandwidth “gigabit Wi-Fi” channels, the advent of 5G networking, and the growth of Internet-of-Things networks will strain the capacity of existing unlicensed bands. In combination with unlicensed access to the 5.9 GHz band, the 6 GHz band presents a unique opportunity to address the pressing need for additional unlicensed mid-band spectrum resources.⁴

At the same time, incumbent users in multiple 6 GHz sub-bands must be “preserve[d] and protect[ed],” as proposed.⁵ NCTA’s members depend on widely-deployed systems in the 6 GHz band to deliver news, sports, and entertainment programming that hundreds of millions of Americans depend on every day. As the plethora of comments in the 3.7-4.2 GHz proceeding established, C-Band FSS sits at the heart of today’s video content distribution ecosystem; both the uplink and downlink connections must be protected.⁶ In addition, BAS authorizations in the

³ Notice ¶ 1.

⁴ Comments of NCTA – The Internet & Television Association, GN Docket No. 17-183, at 2 (Oct. 2, 2017) (NCTA Mid-Band NOI Comments).

⁵ Notice ¶ 2.

⁶ See, e.g., Comments of NCTA – The Internet & Television Association, GN Docket No. 18-122 (Oct. 29, 2018) (NCTA 3.7-4.2 GHz Comments); Comments of the American Cable Association, GN Docket No. 18-122 (Oct. 29, 2018); Comments of the Content Companies, GN Docket No. 18-122 (Oct. 29, 2018); Comments of the Satellite Industry Association, GN

6 GHz band are essential for electronic newsgathering (ENG), the transmission of programming from television studios to transmitter locations (for over-the-air distribution to the public), and the production and distribution of other programming from a variety of venues, including sports arenas and other remote locations. LPAS also supports important consumer services, including wireless microphones.

The Commission should carefully craft technical rules to facilitate both incumbent and new unlicensed uses of the 6 GHz sub-bands. Protecting incumbents should remain the primary focus, but any new rules should, where possible, be harmonized with technical rules applicable to Unlicensed National Information Infrastructure (U-NII) devices that already operate in the 5 GHz band. Most importantly, the Commission should adopt its proposals to:

- Permit standard-power access points (APs) in the 5.925-6.425 GHz (U-NII-5) and 6.525-6.875 GHz (U-NII-7) sub-bands to use power levels permitted for unlicensed use in the U-NII-1 and U-NII-3 bands⁷ to operate on frequencies determined by an Automated Frequency Coordination (AFC) system; and
- Permit indoor, low-power AP operation in the 6.425-6.525 GHz (U-NII-6) and 6.875-7.125 GHz (U-NII-8) sub-bands using lower, more restricted power levels applicable to operations in the U-NII-2 band, so long as those operations do not cause harmful interference to incumbent users.⁸

The Commission should also:

- Adopt higher permissible power limits for all client devices across the 6 GHz band;⁹ and

Docket No. 18-122 (Oct. 29, 2018) (SIA 3.7-4.2 GHz Comments); Comments of Comcast Corporation and NBCUniversal Media, LLC, GN Docket No. 18-122 (Oct. 29, 2018) (Comcast 3.7-4.2 GHz Comments).

⁷ The U-NII-1 band is the 5.15-5.25 GHz band, while the U-NII-3 band is the 5.725-5.85 GHz band. *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, First Report and Order, 29 FCC Rcd 4127 ¶ 4 (2014).

⁸ *Notice* ¶ 20.

⁹ *Id.* ¶ 78.

- Permit AP operations in the U-NII-5 and U-NII-7 bands under the same conditions as proposed for the U-NII-6 and U-NII-8 bands; i.e., low-power, indoor-only use without the need for authorization from an AFC system.¹⁰

Technical analysis on the record suggests that these proposals can likely be adopted while still protecting incumbent operations.¹¹ However, if additional technical analysis in the record suggests that incumbents would not in fact be protected from harmful interference, in either the near or long term, NCTA would no longer support the adoption of such rules.

I. INCUMBENT C-BAND FSS UPLINK, BAS, AND LPAS OPERATIONS MUST BE PROTECTED.

Today's video delivery ecosystem relies extensively on C-Band FSS that uses the 3.7-4.2 GHz band for downlink and the 6 GHz band for uplink.¹² NCTA's members also rely on the 6 GHz band for ENG using BAS, and for wireless microphone operations using LPAS. Any new unlicensed use of the 6 GHz band must protect those incumbent services and the American consumers that depend on them. It is also important to ensure that incumbents have a method available to resolve both near-term and long-term interference issues if unlicensed operations are ultimately permitted in the band.

C-Band FSS Uplinks in the U-NII-5 Band. NCTA's members deliver video programming to more than 100 million U.S. households, including 51.9 million cable subscribers.¹³ The continued viability and reliability of C-Band FSS is extremely important to that video delivery ecosystem. NCTA's largest members rely on C-Band FSS for more than 80

¹⁰ *Id.* ¶ 73.

¹¹ *See generally* Letter from Paul Margie, Counsel to Apple Inc., Broadcom Corporation, Facebook, Inc., Hewlett Packard Enterprise, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183, Attachment (Jan. 26, 2018) (RKf Study).

¹² *See, e.g.*, NCTA Mid-Band NOI Comments, at 2-3; NCTA 3.7-4.2 GHz Comments at 3-6.

¹³ NCTA 3.7-4.2 GHz Comments at 3-4.

percent of the programming they deliver, and its midsize operators are even more dependent on the C-Band, receiving up to 95 percent of their programming via the C-Band.¹⁴ It is not feasible to shift these communications to fiber or other satellite bands, and harmful interference to either uplinks or downlinks would leave television viewers in the dark.¹⁵ Commercial agreements between satellite operators and their customers also often specify radio frequency characteristics. Any new rules must enable satellite operators to continue to meet those contractual obligations.

Because FSS operations in the 6 GHz band support earth-to-space transmissions, any interference from newly-authorized unlicensed APs and client devices would likely occur at space station receivers, and the risk of harmful interference is less than the risk in the 3.7-4.2 GHz C-Band downlink.¹⁶ That said, aggregate interference to space station receivers from unlicensed operations could be harmful to C-Band uplinks. An increase in the noise floor could decrease the reception quality of programming, thereby harming consumers. Technical rules governing new unlicensed operations must be tailored to avoid that outcome, including recognition of the long-term implications of increasing unlicensed use of the band.¹⁷

BAS and LPAS Wireless Microphone Operations in the U-NII-6 and U-NII-8 Bands.

Some of NCTA's programmer and network affiliate members utilize BAS ENG systems to collect and deliver content for distribution to consumers. These entities also use LPAS for

¹⁴ *Id.*

¹⁵ *See, e.g.,* Comcast 3.7-4.2 GHz Comments at 17-22; SIA 3.7-4.2 GHz Comments at 12-16.

¹⁶ *Notice ¶¶ 24, 55.* As discussed in greater detail below, however, unlicensed use could cause direct interference to C-Band uplinks in certain circumstances, and it is important for this reason that earth station information be included in the AFC database. *See infra* Part III.

¹⁷ *Notice ¶ 55; see also* Comments of the Satellite Industry Association, GN Docket No. 17-183, at 41-44 (Oct. 2, 2017). Below, NCTA discusses the key technical rules needed to achieve this objective. *See infra* Part III.

wireless microphone operations. These operations would be susceptible to harmful interference from new unlicensed uses, and such interference could disrupt programming.

II. AUTHORIZING UNLICENSED USE OF THE 6 GHZ BAND WOULD ENABLE IMPORTANT WI-FI OPPORTUNITIES.

The 6 GHz band presents a clear opportunity for the Commission to address the need for additional unlicensed spectrum for Wi-Fi and other unlicensed technologies, and NCTA urges the Commission to consider the use of unlicensed, rather than licensed services across the whole band. Wi-Fi is essential to Americans' broadband experience, and its importance continues to grow. Cisco's Visual Networking Index projects that Wi-Fi will account for 49 percent of total Internet Protocol traffic in the United States by 2022, the largest by far of any wireless technology, and an increase from 38 percent in 2017.¹⁸ Cisco further projects that Wi-Fi will account for 56.6 percent of Internet traffic in the United States by 2022, up from 50.4 percent in 2017,¹⁹ and that 63 percent of mobile traffic will be offloaded onto Wi-Fi and femtocells by 2021.²⁰ Other estimates predict that total Wi-Fi traffic in the United States will double by 2020.²¹ These statistics reflect what is evident from daily experience: At home, at work, and across communities, Wi-Fi is the single most important technology through which Americans access broadband. Wi-Fi access is also increasingly central to the mobile Internet – as the *Notice*

¹⁸ Cisco Systems Inc., *Cisco Visual Networking Index, VNI Global Fixed and Mobile Internet Traffic Forecasts, 2017-2022, VNI Forecast Highlights Tool*, https://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html (last visited Feb. 15, 2019).

¹⁹ *Id.*

²⁰ Cisco Systems Inc., *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021*, at 18 (Feb. 7, 2017), <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.pdf>.

²¹ Raul Katz, Telecom Advisory Services LLC, *A 2017 Assessment of the Current & Future Economic Value of Unlicensed Spectrum in the United States* 75 (Apr. 2018) (Katz Report).

recognizes, “many cable companies and wireless carriers have established networks of Wi-Fi hotspots that give their customers access to high-speed data connections when away from home.”²²

Wi-Fi’s contribution to the U.S. economy is also enormous – and growing. Recent research estimates that Wi-Fi and other unlicensed technologies contribute at least \$496 billion in economic surplus and \$29 billion to gross domestic product today.²³ Wi-Fi’s total economic contribution is expected to reach more than \$834 billion by 2020.²⁴ Future economic gains could be even more dramatic, as “the beauty of unlicensed spectrum is that no one can predict what American innovators and creative geniuses will think up next,” given the level playing field and low barriers to entry.²⁵

The growth and economic benefits Wi-Fi delivers depend on access to additional unlicensed spectrum, because existing bands cannot keep up with the “explosive” demand.²⁶ Absent action, including opening the 5.9 GHz band for unlicensed use and adopting favorable unlicensed access rules for the 6 GHz band, existing unlicensed spectrum bands could soon reach exhaust conditions, jeopardizing the tremendous investment and innovation already put towards next-generation applications, including the Internet of Things, and causing residential broadband and business and industrial applications to suffer service degradation. This is why both the Commission and Congress have recognized the need for more unlicensed spectrum to be made

²² Notice ¶ 5.

²³ Katz Report at 1.

²⁴ *Id.*

²⁵ Notice at 50 (Statement of Commissioner Michael O’Rielly).

²⁶ *Id.* ¶ 3.

available quickly.²⁷ A 2016 Qualcomm study concluded that “regulators should plan for around 1280 MHz of unlicensed spectrum centered around the 5 GHz band for use by unlicensed technologies,”²⁸ while a 2017 study by Quotient Associates similarly concluded that between 788 megahertz and 1.6 gigahertz of new mid-band spectrum will be needed by 2025 to satisfy demand just for Wi-Fi.²⁹ The demands on unlicensed spectrum will only grow as 5G technologies and more Internet-of-Things networks are deployed, given the central role unlicensed spectrum plays in these technologies.

Finally, the next-generation Wi-Fi standard, 802.11ax or “Wi-Fi 6,” will play an important role in the delivery of ultra-high performance networks (10G) that will “reinvent the role technology plays in our everyday lives – from remote diagnostics that will help our doctors monitor their patients from anywhere in real-time to video walls and AR applications that will help our children learn and collaborate with others all across the globe.”³⁰ Wi-Fi 6 will be capable of distributing gigabit services wirelessly throughout America’s homes and businesses.³¹ However, additional unlicensed spectrum to accommodate 160-megahertz unlicensed channels is needed to make all of these enhanced applications work. Today, channels this wide are not accessible without the constraints of burdensome Dynamic Frequency Selection (DFS)

²⁷ See, e.g., *id.* ¶ 18; 47 U.S.C. § 1502(a)(2)(A).

²⁸ Rolf de Vegt et al., Qualcomm Techs., Inc., *A Quantification of 5 GHz Unlicensed Band Spectrum Needs* 5 (2016).

²⁹ Steve Methley & William Webb, Quotient Assocs. Ltd., *Wi-Fi Spectrum Needs Study* 26, 28 (2017).

³⁰ Michael Powell, *The 10 Gigabit Network of the Future*, NCTA (Jan. 7, 2019), <https://www.ncta.com/whats-new/the-10-gigabit-network-of-the-future>.

³¹ See Wi-Fi Alliance, *Discover Wi-Fi, Wi-Fi CERTIFIED 6*, <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6> (last visited Feb. 15, 2019); Letter from Rick Chessen, Chief Legal Officer, Senior Vice President, Legal & Regulatory Affairs, NCTA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49, at 3 (Oct. 16, 2018) (*5.9 GHz Ex Parte*).

limitations,³² making the potential 6 GHz allocations, which would support wide channels without DFS, particularly critical.³³

III. THE COMMISSION SHOULD ADOPT CAREFULLY CRAFTED TECHNICAL RULES TO FACILITATE COEXISTENCE BETWEEN INCUMBENT AND UNLICENSED USES.

Given the continued importance of incumbent 6 GHz services, as well as the need for additional unlicensed spectrum, the Commission should adopt sharing solutions that fully protect satellite, BAS, and LPAS incumbents from harmful interference, while also facilitating robust unlicensed use across the band. Prior experience and analysis in this proceeding suggest this end result is possible. Unlicensed devices have a successful track record of sharing spectrum with other users on a non-interference basis,³⁴ and a study submitted last year provides technical data suggesting that incumbents can successfully coexist with new unlicensed services.³⁵

Where doing so is possible while protecting incumbents in the band, the Commission should harmonize technical rules for the 6 GHz sub-bands with the rules governing the existing U-NII bands. These rules are proven to support real-world deployment scenarios and consumer needs. Ensuring that key technical criteria are as consistent as possible across the U-NII bands will also simplify device design, which in turn will allow equipment manufacturers to more efficiently produce compatible equipment at scale.

³² *5.9 GHz Ex Parte* at 3.

³³ For the same reason, enabling unlicensed use of the 5.9 GHz band is also important. As NCTA has argued elsewhere, the Commission should initiate a rulemaking or other appropriate vehicle to open all or a portion of that band to promote unlicensed innovation and investment, while considering how to more flexibly address the need for low-power, point-to-point connectivity in the automotive sector using one or more alternative spectrum bands. *See generally 5.9 GHz Ex Parte*.

³⁴ NCTA Mid-Band NOI Comments at 10.

³⁵ *See generally* RKF Study.

A. The Commission Should Adopt its Proposed Technical Rules for U-NII-5 and U-NII-7 Operations with Minor Modifications.

Power Limits. NCTA supports the Commission's proposal to adopt U-NII-1 and U-NII-3 power limits for new U-NII-5 and U-NII-7 APs.³⁶ U-NII-1 and U-NII-3 channels are used far more often than other unlicensed sub-bands, chiefly due to a combination of higher power limits and the absence of DFS requirements.³⁷ Given the directionality and gain of satellite point-to-point (P2P) links, the proposed power limits will support robust Wi-Fi deployments, while also appearing to protect incumbent C-Band uplinks.

Additional limitations on power levels for unlicensed antennas pointing toward the geostationary arc in the U-NII-5 and U-NII-7 sub-bands may also help mitigate the risk of potential harmful aggregate interference to FSS.³⁸ Thus, NCTA supports the adoption of a requirement that EIRP be reduced where outdoor, standard-power AP elevation angle exceeds 30 degrees, similar to the U-NII-1 restriction.³⁹

NCTA also would support higher power operations on a fixed P2P or fixed point-to-multipoint (P2MP) basis in rural and underserved areas,⁴⁰ as long as those operations would not materially increase the risk of interference to C-Band uplinks or existing Wi-Fi networks. Higher power limits would enable fixed wireless services to deliver broadband to consumers who may otherwise be unserved or underserved.

³⁶ Notice ¶¶ 22, 78-79.

³⁷ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd. 6373 ¶ 30 (2017); NCTA Mid-Band NOI Comments at 10-11.

³⁸ Notice ¶ 55.

³⁹ *Id.*; see 47 C.F.R. § 15.407(a)(1). However, no such restriction is warranted for indoor-only, low-power APs in these sub-bands.

⁴⁰ Notice ¶ 79.

Out-of-Band Emissions. While the Commission proposes to adopt out-of-band emissions (OOBE) limits consistent with the rules for the U-NII-1 and U-NII-2 bands,⁴¹ NCTA urges the Commission to instead adopt the OOBE mask that currently applies to the U-NII-3 band.⁴² The U-NII-3 OOBE rules have contributed to making the band the most widely utilized of the 5 GHz bands; the Commission should aim to replicate that success to the greatest extent possible in the 6 GHz band. Maintaining consistency with U-NII-3 will also allow equipment manufacturers to efficiently develop devices leveraging the full set of U-NII bands. By contrast, complying with a -27 dBm/MHz limit at the band edge and beyond, as proposed, would require considerable reductions in power at the band edge and in the wider bandwidth channels that are becoming increasingly common in Wi-Fi devices, thus diminishing both coverage and capacity for Wi-Fi APs, and potentially creating inconsistent user experience across multi-AP networks.

Automated Frequency Coordination. NCTA agrees that an AFC mechanism is necessary for outdoor operations in order to protect incumbent uses.⁴³ NCTA cautions, however, that implementing AFC will create product design challenges, as well as downstream operational burdens, including the need to develop new network management platforms. Given these complexities, it may take more time for commercial products to be deployed as compared to other unlicensed bands.

⁴¹ *Id.* ¶ 82 & n.169.

⁴² See 47 C.F.R. § 15.407(b)(4)(i) (“All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.”).

⁴³ *Notice* ¶ 23.

To facilitate additional protections from potential harmful interference at transmit earth station locations, the Commission should include information in the AFC database that allows the creation of an interference profile for each earth station.⁴⁴ As the *Notice* explains, 6 GHz FSS operations are limited to satellite uplinks, so direct interference to transmit earth stations from unlicensed uses “would *in most case[s]* have a negligible effect.”⁴⁵ But such interference remains a possibility. For example, if an unlicensed device were to transmit close to an uplink earth station, the earth station’s antenna may pick up, amplify, and transmit the unlicensed user’s signal to its associated satellite transponder, potentially creating significant anomalies and/or outages in the video feed transmitted back to earth via the downlink. Earth station registration could help identify and mitigate interference if such uplink satellite signal degradation is detected.

Access Point Height. The Commission should not adopt a specific height limit for outdoor, standard-power APs.⁴⁶ The proposed 30-meter limit may not be adequate for P2P links or P2MP systems, and it also could preclude deployments in certain other environments, such as open-air stadiums. Instead, the Commission should require the AFC to calculate an exclusion zone contour based on the actual height of any given AP as it determines available frequencies.

However, if the Commission were to establish a maximum height, the rules should allow for exceptions in certain circumstances. Specifically, the Commission should permit heights of up to 90 meters for standard-power APs in rural areas. This higher limit would enable fixed wireless operators to provide broadband services in a greater number of areas, including rural

⁴⁴ *Id.* ¶ 24.

⁴⁵ *Id.* (emphasis added).

⁴⁶ *See id.* ¶ 51 (seeking comment on a maximum height of 30 meters).

areas, utilizing directional antennas aimed at client devices. The directionality of the antennas in these types of deployments would minimize the potential for harmful interference.

Professional Installation. The *Notice* suggests that professional installation may be required in order to ensure that the height of standard-power APs can be accurately verified for purposes of AFC-based coordination.⁴⁷ While some benefits may result from a professional installation requirement, it could at the same time increase deployment costs and times substantially. For instance, such a requirement could necessitate new training and certification for installers and may even limit the available pool of qualified installers. This would be particularly burdensome for non-enterprise deployments, such as homes and small businesses.

Alternative approaches to ensuring the accuracy of height information would avoid a burdensome professional installation requirement, while still addressing the need for accurate height information. For instance, the Commission could allow industry to develop solutions to accurately assess and report AP height to the AFC system, with verification of the efficacy of any particular methodology during the equipment authorization process.

If the Commission were to adopt a professional installation requirement, it should exempt all indoor installations, such as Wi-Fi routers used in homes and businesses, as well as outdoor installations below a height of six meters.⁴⁸ Residential and small business consumers increasingly prefer to self-install their own equipment, which saves time and simplifies the service activation process, while also reducing costs for the network operator.⁴⁹ Such equipment

⁴⁷ *Id.* ¶ 52.

⁴⁸ A six-meter outdoor exception would enable non-professional installation in residential settings; e.g., a patio or deck.

⁴⁹ *See, e.g., Basic Service Tier Encryption et al.*, Report and Order, 27 FCC Rcd. 12786 ¶¶ 12-13 (2012) (noting the growing trend of customer self-installation and self-activation of cable

is also nearly always used indoors, where building attenuation substantially reduces the risk of harmful interference. By contrast, prohibiting self-installation of such equipment could dramatically hinder Wi-Fi deployments upon which consumers and businesses depend.

Transmission of Identifying Information. The Commission should not require standard-power APs, low-power APs, or associated client devices to transmit digital identifying information. Some parties have suggested that such transmissions would allow unlicensed users causing harmful interference to incumbents to be easily identified and notified,⁵⁰ but the Commission has declined to adopt such requirements in all other U-NII sub-bands due to the substantial complexity and costs they add for unlicensed uses.⁵¹ Wi-Fi APs already transmit a Service Set Identifier (SSID), and licensed assisted access (LAA) transmissions include Home Network Identity (HNI) information, making the need for the transmission of any additional information questionable. Furthermore, under the low power limits proposed for the 6 GHz sub-bands, the source of any interference would generally be close by and thus relatively easy to locate.

Should the Commission deem the transmission of identifying information to be necessary, it should require only a single, *network-specific* identifier to minimize the burden on network operators and users. Such a requirement could facilitate prompt communication related to any interference issues. The Commission should in no event require *device-specific* identifiers, which would greatly complicate inventory management and implicate complicated user privacy concerns without corresponding benefits.

equipment and discussing the myriad benefits to both subscribers and operators of this option).

⁵⁰ See Notice ¶¶ 87-88.

⁵¹ See *id.* ¶ 87 n.174.

B. The Commission Should Adopt its Proposed Technical Rules for U-NII-6 and U-NII-8 Operations.

NCTA supports the Commission's proposed technical rules for the U-NII-6 and U-NII-8 sub-bands, as long as the record demonstrates that the rules will protect incumbent services from harmful interference. Low-power, indoor-only operations would provide benefits for many residential users, particularly as the use of mesh networks for whole-home coverage increases. Due to the lower power levels, walls and windows should greatly attenuate signal strength at these frequencies, thus likely avoiding harmful interference to incumbents in the band. If the record in this proceeding demonstrates that the proposed rules would result in harm to BAS, LPAS, or other incumbent services, however, NCTA would support further study of mitigation measures that may be required to permit non-interfering unlicensed use.

Enforcing an indoor-only requirement presents challenges, as the Commission recognizes, but similar challenges have been overcome in the past, and solutions are available.⁵² To provide interference protection while at the same time promoting innovation, the Commission should permit industry to develop novel solutions and demonstrate compliance with indoor-only requirements during the equipment authorization process, rather than requiring a specific methodology that could unduly constrain product design and/or be circumvented by end users. The equipment authorization process could also require that manufacturers that identify a product for outdoor use demonstrate that the device's software does not permit operation in the U-NII-6 and U-NII-8 bands.

⁵² *Id.* ¶ 71.

C. The Commission Should Permit Indoor, Low-Power Access Point Operations in the U-NII-5 and U-NII-7 Bands without AFC.

NCTA favors the ability to deploy indoor, low-power APs across all 6 GHz sub-bands without AFC, provided that such operations do not interfere with incumbent operations.⁵³ Permitting consistent indoor, low-power, non-AFC use across the band would provide substantial benefits to users' experiences by enabling wider channels across a broad swath of spectrum,⁵⁴ and by increasing the number of available channels to increase spectrum capacity, particularly in high-density environments. An AFC requirement for low-power devices in the U-NII-5 and U-NII-7 bands would unnecessarily burden indoor residential and small businesses deployments with recurring costs, depressing incentives to deploy widely in these sub-bands. And, as the Commission acknowledges, so long as indoor power levels are limited to 250 mW, as proposed, attenuation from walls and windows should prevent interference to C-Band uplinks.⁵⁵

D. The Commission Should Adopt Higher Permissible Power Levels for All Client Devices.

To enhance consumers' experience and the utility of devices across the 6 GHz band, the Commission should adopt higher client device power and power spectral density (PSD) limits. The *Notice* proposes a maximum conducted output power of 63 mW and a maximum PSD of 5 dBm in any 1 megahertz band, noting that these power limits align with those utilized in the RKF

⁵³ See *id.* ¶ 73 (also seeking comment on what power levels could be permitted for such operation without increasing the risk of harmful interference to licensed services).

⁵⁴ Wi-Fi channelization does not line up well with the 6 GHz sub-bands' boundaries.

⁵⁵ *Notice* ¶ 70 ("We note that the ITU model shows a median building entry losses of approximately 18 dB for traditional construction and 30 dB for thermally efficient construction for horizontal incidence, with increasing building entry losses at larger elevation angles.").

Study and those found in equipment authorization applications.⁵⁶ Instead, the Commission should limit maximum conducted output power to 250 mW and maximum PSD to 21 dBm/MHz for devices not subject to AFC, and 27 dBm/MHz for devices that are subject to AFC.⁵⁷ Adopting these limits would enhance the experience of end users by increasing devices' coverage and range. It would also reduce the disparity between downlink and uplink data carrying capacity and simplify the design of AP antenna systems. Including the interference profiles of client devices in AFC will allow it to manage the potential from harmful interference, even with a higher 250 mW power limit. And, as discussed above, the attenuating effects of buildings will limit the interference potential from indoor uses to negligible levels.

⁵⁶ *Id.* ¶¶ 78-79 & n.164. Importantly, the RKF study did not contemplate an AFC mechanism.

⁵⁷ These higher power spectral density limits would allow 6 GHz unlicensed devices to take full advantage of orthogonal frequency-division multiple access (OFDMA) technology.

CONCLUSION

Additional unlicensed mid-band spectrum is needed to support next-generation Wi-Fi and alleviate Wi-Fi congestion in existing unlicensed bands that businesses and consumers demand. The Commission should therefore adopt its proposals to enable unlicensed use of the 6 GHz band, while also protecting important incumbent uses, including C-Band uplinks, BAS, and wireless microphones. By adopting its proposed rules for the 6 GHz band, with minor modifications, the Commission will simultaneously support wireless innovation, help to narrow the digital divide, and protect video distribution services on which millions of U.S. consumers currently depend.

Respectfully submitted,

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