Before the
Federal Communications Commission
Washington, DC 20554

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

To: The Commission

COMMENTS OF THE WIRELESS INTERNET SERVICE PROVIDERS ASSOCIATION

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Summary

Many rural Americans rely on unlicensed spectrum for their broadband connection. But that spectrum is becoming noisy and crowded, and with licensed spectrum locked up by larger providers, small fixed wireless broadband providers who want to offer uncapped high-speed service find themselves with limited ability to do so. It is critical for rural broadband that more outdoor-friendly unlicensed spectrum be made available.

That is why the Wireless Internet Service Providers Association ("WISPA") is pleased to support the Commission's efforts to make available 1200 megahertz of spectrum in the 6 GHz band for unlicensed use. Our members currently make intensive use of licensed spectrum for point-to-point communications in the 6 GHz band, and at the same time need more unlicensed spectrum to support the next generation of broadband service. Thus, WISPA is uniquely situated to both understand the need to protect licensees from harmful interference and to capitalize on opportunities by enabling spectrum to be shared for a myriad of unlicensed uses. Through deployment in the 6 GHz band, congestion in the 5 GHz band can be alleviated, potential for interference among unlicensed U-NII devices can be reduced, rural deployment opportunities can be maximized, and increasing consumer demand can be met. In sum, as an extension of the 5 GHz band, additional spectrum will create more "parking spots" for the ever-increasing number of unlicensed devices that consumers use.

But authorization for higher power use is critical for enabling this band to be used for rural broadband. In addition to lower-power uses, WISPA strongly urges the Commission to allow fixed client devices operating at conducted power up to +18 dBm in the 5925-6425 MHz (U-NII-5) and 6525-6875 MHz (U-NII-7) bands to use up to 18 dB antenna gain before reducing power. The rules should be harmonized with the rules for the 5 GHz U-NII band to the extent possible to leverage the existing equipment and technology marketplace that can readily adapt to

the 6 GHz band to accelerate deployment without the need for an entirely new equipment cycle to be developed. Higher-power operations in 850 megahertz of spectrum should be permitted via easily implemented automated frequency coordination ("AFC") to ensure incumbents are protected from harmful interference.

It is also imperative that, in enabling unlicensed use of the band, the Commission protect licensed operations. WISPA's comments provide a comprehensive approach to the interference protection scheme and AFC design that will ensure coordinated and non-interfering Part 15 use of higher-power client devices. Given the absence of federal incumbents and mobile operations in the band, the AFC can be designed as, in the Commission's words, a "simple database that is easy to implement" to provide interference protection and to promote efficient and responsible unlicensed use. An access point should be required to obtain permission from the AFC for it and associated client devices to access spectrum at a particular location. The Commission need not mandate a complicated spectrum access system similar to that being implemented for the Citizens Broadband Radio Service, an outcome that would "over-engineer" automated spectrum access, driving up equipment costs and delaying unlicensed access to the band. Technical rules should allow for both standard-based (e.g., Wi-Fi, LTE) and proprietary equipment to foster different use cases, most notably in rural areas. The Commission also should permit higher-power operations in the lightly used lower 100 megahertz of the U-NII-8 band.

WISPA also supports making the entire 1200 megahertz in the 6 GHz band available for lower-power indoor operations, without the need for AFC, to support Wi-Fi and other consumer uses. WISPA believes that lower-power operations and higher-power operations in the U-NII-5 and U-NII-7 bands can coexist.

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The Wireless Internet Service Providers Association ("WISPA"), pursuant to Sections 1.415 and 1.419 of the Commission's Rules, hereby submits its initial Comments in response to the Notice of Proposed Rulemaking in the above-captioned proceedings ("*NPRM*").[1]

As the trade association representing more than 800 providers of fixed wireless broadband service to millions of American consumers, WISPA has a strong interest in advocating for efficient access to more unlicensed spectrum, particularly when and where spectrum can be effectively shared with incumbents. Because WISPA's members are also making intensive use of licensed spectrum for point-to-point communications in the 6 GHz band, WISPA is uniquely situated to both understand the necessity to protect incumbent licensees from harmful interference and to recognize opportunities to enable spectrum to be shared for unlicensed uses.[2]

[1] *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Proposed Rulemaking, ET Docket No. 18-295 and GN Docket No. 17-183, FCC 18-147 (rel. Oct. 24, 2018). The *NPRM* was published in the Federal Register on December 17, 2018. *See* 83 Fed. Reg. 64506 (Dec. 17, 2018).

[2] *See NPRM* at 2 ¶ 2 (emphasizing Commission's "commitment to preserve and protect the important base of incumbent users in these frequency bands").

In support of these twin objectives, WISPA applauds the Commission's adoption of the *NPRM* and its incorporation of proposals and questions regarding allocation of the 6 GHz (5925-7125 MHz) band for unlicensed use. In particular, WISPA appreciates the Commission's inclusion of WISPA's recommendation[3] that the Commission seek comment on higher power limits for standard-power unlicensed use,[4] and strongly urges the Commission to allow fixed client devices operating at conducted power up to +18 dBm in the 5925-6425 MHz (U-NII-5) and 6525-6875 MHz (U-NII-7) bands under Part 15 of the Commission's rules to use up to 18 dB antenna gain before reducing power. Consistent with Congressional mandate, enabling higher-power operations in this 850 megahertz of spectrum, accessible via automated frequency coordination ("AFC") to ensure incumbents are protected from harmful interference, will alleviate congestion in the 5 GHz band, mitigate the potential for interference among unlicensed U-NII devices, maximize rural deployment opportunities, and meet increasing consumer demand for more bandwidth.[5] The Commission also should permit higher-power operations in the lightly used lower 100 megahertz of the U-NII-8 band.

Given its proximity to the 5 GHz U-NII band and assuming adoption of harmonized technical rules, manufacturers are well positioned to quickly adapt their higher-power WISP equipment to operate in the U-NII-5 and U-NII-7 bands, thereby driving innovation, competition, and investment that will accelerate access to fixed broadband services. In so doing, the Commission should be careful to ensure that its technical rules allow for both standard-based (e.g., Wi-Fi, LTE) and proprietary equipment to foster different use cases, most notably in rural

[3] *See* Letter from Stephen E. Coran, WISPA Counsel, to Marlene H. Dortch, FCC Secretary, GN Docket No. 17-258, ET Docket No. 18-295 and GN Docket No. 17-183 (filed Oct. 17, 2018) at 3 (asking Commission to seek comment on coordinated, higher-power use for more expansive outdoor operations).
[4] *NPRM* at 29 ¶ 79.
[5] *See* Consolidated Appropriations Act, 2018, P.L. 115-141, Division P, the Repack Airwaves Yielding Better Access of Users of Modern Services ("RAY BAUM'S Act").

areas. This result would be consistent with a primary Commission objective: "The broad swaths that we propose making available in this frequency band could promote new technology and services that will advance the Commission's efforts to make broadband connectivity available to all Americans, *especially those in rural and underserved areas*."[6]

WISPA also supports adoption of proposals to make the entire 6 GHz band available for lower-power indoor operations to support Wi-Fi and other consumer uses. WISPA believes that lower-power operations are not likely to interfere with higher-power or licensed operations in the U-NII-5 and U-NII-7 bands and, in any case, allowing lower-power use will make coordination easier because there will be more spectrum "parking spots" available for unlicensed devices.

To accommodate unlicensed operations in the band, it will be necessary for the Commission to protect licensed operations. Because there are no federal incumbents or mobile operations in the band, WISPA agrees that, for higher-power operations, the AFC can be designed as a "simple database that is easy to implement" to provide interference protection and to promote efficient and responsible unlicensed use.[7] An access point should be required to obtain permission from the AFC for it and associated client devices to access spectrum at a particular location. Requiring a complicated spectrum access system similar to that being implemented for the Citizens Broadband Radio Service ("CBRS") is unnecessary in the U-NII-5 and U-NII-7 bands and would "over-engineer" automated spectrum access, driving up equipment costs and delaying unlicensed access to the band.

[6] *NPRM* at 2 ¶ 1 (emphasis added).
[7] *Id.* at 11 ¶ 25.

Discussion

I. THE PUBLIC INTEREST SUPPORTS MAKING AVAILABLE ADDITIONAL UNLICENSED SPECTRUM

A. Existing Unlicensed Bands Cannot Accommodate Future Demand

In responding to the Notice of Inquiry that precipitated this proceeding,[8] WISPA and some of its members joined a large and diverse group of stakeholders in urging the Commission to initiate a rulemaking proceeding to enable shared, unlicensed use of the 6 GHz band.[9] This coalition cited a report from Quotient Associates that documented an unlicensed spectrum shortfall of between 540 and 1,588 megahertz by 2025.[10] The *NPRM* cites similar data documenting the ongoing increase in communications traffic over unlicensed devices.[11] In recognition of this trend and the need to balance the allocation of licensed and unlicensed spectrum, Congress passed RAY BAUM'S Act in 2018 directing the Commission and NTIA to "identify 255 megahertz of Federal and non-Federal spectrum for mobile and fixed wireless broadband use."[12]

Congestion and demand for more additional unlicensed spectrum are not confined to lower-power, standard-based Wi-Fi devices, but includes higher-power, proprietary devices that can be used to enable broadband access across wide swaths of rural America, the Internet of Things ("IoT") and other potential use cases, including those as yet unimagined.[13] Without the Commission's prescient decision more than 30 years ago to make "junk bands" available for

[8] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry 32 FCC Rcd 6373 (2017) ("*Mid-Band NOI*").
[9] *See* Comments of All Points Broadband, *et al.*, GN Docket No. 17-183 (filed Oct. 2, 2017) ("Coalition NOI Comments"). In addition to WISPA, its members joining the Comments included All Points Broadband, Amplex Internet, Blaze Broadband, Cambium Networks, Joink, MetaLINK Technologies, New Wave Net, Pixius Communications, Rise Broadband, Snappy Internet and Wisper ISP.
[10] *See id.* at 6.
[11] *See NPRM* at 3-4 ¶¶ 6-7.
[12] RAY BAUM'S Act, § 603(a)(1).
[13] *See NPRM* at 4 ¶ 7.

unlicensed use, we would not have a vibrant and rapidly expanding nationwide WISP business that today serves millions of Americans who would otherwise lack access to terrestrial broadband service. The ability to quickly deploy service, without a license, lowers barriers to market entry, stimulates competition among equipment manufacturers, and spurs innovation to drive economic growth, educational opportunities, and civic engagement.

Access to an additional 1200 megahertz of unlicensed spectrum proximate to the 5 GHz band will alleviate growing congestion in that band.[14] Long the "workhorse" for WISPs, the 5 GHz band has been a fountain of innovation, competition, and deployment, but WISPs are finding it more difficult to expand operations and re-use frequencies because capacity is nearing its usable limit as an increasing number of other unlicensed consumer devices threatens to crowd out network growth. In the three years since the Commission made the U-NII-1 band (5150-5250 MHz) available for outdoor deployment, WISPs have rapidly expanded into that band. There has also been substantial deployment in the lightly-licensed 3650-3700 MHz band, which is also at maximum capacity in many areas, further confirming the need for more spectrum to increase capacity within markets. Many in-home Wi-Fi routers use 5 GHz channels, and in places where signals are not attenuated by walls and other physical barriers, WISPs are facing an increasing need to coordinate higher-power outdoor broadband operations with indoor Wi-Fi devices at consumers' premises. By creating more spectrum "parking spots" to accommodate both outdoor and indoor devices, WISPs can better plan and coordinate spectrum use when service is installed at the consumer's premises, improving service quality and reducing service interruptions.

[14] In a separate proceeding, WISPA is asking the Commission to refresh the record concerning use of the 5850-5925 MHz (U-NII-4) band. *See, e.g.*, Letter from Claude Aiken, WISPA President & CEO, to Marlene H. Dortch, FCC Secretary, ET Docket No. 13-49 (filed Oct. 26, 2018). Together with the 6 GHz band, unlicensed use of the 5.9 GHz band would create a large, contiguous block of unlicensed spectrum.

B. The 6 GHz Band Can Help Meet Consumer Demand And Accelerate Broadband Access

Summarizing its request for unlicensed access to the 6 GHz band, the coalition stated as follows:

> Unlicensed broadband operations are especially well suited to operating in the 6 GHz band, while protecting its incumbents from harmful interference. Wi-Fi use has proven to provide protection for existing users in other bands via Part 15 rules and mitigations. Unlike hypothetical new licensed use in this band, adding unlicensed broadband use would allow incumbent services to grow and manage their networks in the future without imposing any new coordination obligations or other limits on licensees—while substantially increasing the overall use and value of the band, due to its proximity to the widely used 5 GHz unlicensed bands.[15]

In unanimously adopting the *NPRM* and in reliance on the record established in response to the *Mid-Band NOI*, each Commissioner signaled their support for adopting rules permitting sharing of the 6 GHz for unlicensed uses. Chairman Pai observed that "in the last three decades, unlicensed devices have proliferated. . . . Indeed, they've become so popular that there is now a shortage of airwaves dedicated for their use."[16] Commissioner O'Rielly, affirming that the 6 GHz band "is a prime location for unlicensed services for multiple reasons," likewise noted that "it is undisputed that the exponential growth of wireless data, especially over unlicensed networks, has led to severe congestion in our highly-prized unlicensed spectrum bands, primarily 2.4 and 5 GHz."[17] Commissioner Carr stated that "[y]our neighbors, your family, and nearby businesses are all competing for a relatively limited amount of unlicensed spectrum. And those spectrum bands are getting congested."[18] Commissioner Rosenworcel agreed that:

> Already our current Wi-Fi bands are congested because they are used by more than 9 billion devices. By the end of the decade, we will see as many as 50 billion new devices connecting to our networks through the internet of things. Add this

[15] Coalition NOI Comments at 4.
[16] *NPRM*, Statement of Chairman Ajit Pai, at 1.
[17] *NPRM*, Statement of Commissioner Michael O'Rielly, at 1.
[18] *NPRM*, Statement of Commissioner Brendan Carr, at 1.

> up. We're going to need a significant swath of new unlicensed spectrum to keep up with demand.[19]

Commissioner Starks stated at his Senate confirmation hearing that "with regard to spectrum, it is going to be essential that we continue to have more and more spectrum that is able to be brought to the market that is low-, mid- and high-band."[20]

In order to meet demand, alleviate congestion, and stimulate investment and innovation, it is necessary to examine ways in which existing spectrum bands can be shared among incumbents and new users. It is simply not acceptable for spectrum to remain fallow or underutilized when modern and evolving means of sharing spectrum can both facilitate spectral efficiency and protect incumbents from harmful interference.

Over the last 15 years or so, the Commission's spectrum allocation scheme has evolved from a binary licensed-unlicensed model to newer approaches that effectively leverage databases and technology to enable greater spectral efficiency and use. In 2005, the Commission adopted a "light licensing" scheme for the 3650-3700 MHz band in which applicants could obtain nationwide, non-exclusive licenses and provide service upon registration of individual fixed locations in the FCC's Universal Licensing System ("ULS").[21] Licensees are encouraged to review ULS before registering locations, to coordinate operations with each other and to cooperate to resolve interference. Overall, there have been very few instances of interference requiring Commission resolution. From this manual spectrum sharing model, the Commission adopted rules in 2008 allowing unlicensed use of vacant television channels governed by a database that identifies whether or not a TV channel is vacant and therefore available for

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[19] *NPRM*, Statement of Commissioner Jessica Rosenworcel, at 1.
[20] Testimony of Geoffrey A. Starks before the Senate Commerce, Science, & Transportation Committee (June 20, 2018), *available at* https://www.commerce.senate.gov/public/index.cfm/hearings?ID=D0CD5451-0815-4270-AE98-EA50B6CEDC51 (last visited Jan. 25, 2018).
[21] *See Wireless Operations in the 3650-3700 MHz Band*, 20 FCC Rcd 6502 (2005).

unlicensed use in a given area.[22] This was the first time the Commission delegated real-time spectrum management functions to private database administrators that collaborated to build an interference management system. More recently, in 2015, the Commission adopted its CBRS rules that established a complex three-tier spectrum access system that dynamically assigns spectrum not just on given channels in given areas, but in given access tiers – incumbent use, priority licensing and licensed-by-rule general authorized access.[23]

With each evolutionary step in spectrum access management, the Commission has increased certainty with respect to when, where and on what tier spectrum access can be provided, reducing engineering disputes over what constitutes "harmful" or "unacceptable" levels of interference. By utilizing automated spectrum access with openly transparent database management, stakeholders and spectrum users are able to more reliably predict what they can do with spectrum.

As discussed below, the 6 GHz band is ripe for sharing. The experiences of the Commission and industry in Part 101 frequency coordination and in developing spectrum sharing models can be leveraged rather easily in the 6 GHz band while protecting incumbent licensees and without limiting their ability to modify and obtain new licenses. Preserving the status quo, on the other hand, would perpetuate spectrum warehousing by keeping spectrum away from prospective users. The cost of maintaining an antiquated "no sharing" model would be high – consumers would continue to lack access to broadband services, congestion would continue to proliferate, and innovation would be stymied. Commission policies reflect the need to make efficient use of spectrum resources, and adopting responsible and transparent sharing methods

[22] *See Unlicensed Operations in the TV Broadcast Bands*, 23 FCC Rcd 16807 (2008).
[23] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, 30 FCC Rcd 3959 (2015).

for 1200 megahertz of spectrum is an obvious – and important – next step for the Commission to take.

II. THE COMMISSION SHOULD AUTHORIZE HIGHER-POWER UNLICENSED OPERATIONS IN THE U-NII-5 AND U-NII-7 BANDS

In the *NPRM*, the Commission proposes a maximum EIRP limit of 24 dBm for client devices, though it acknowledges that this limit deviates from the Part 15 rules allowing higher gain antennas in the 5 GHz band.[24] The Commission thus seeks comment "on whether higher power operations could be permitted in rural and underserved areas under certain conditions."[25]

There can be little doubt that authorizing higher power operations -- more specifically, higher antenna gain client devices – would be consistent with the public interest and Congressional objectives, and thus could and should be permitted in the U-NII-5 and U-NII-7 bands. If higher-EIRP operations in the U-NII-5 and U-NII-7 bands were to be allowed on a basis similar to the way in which antenna gain limits are applied in the 5 GHz band, WISPs and others could provide fixed service to a range of about six miles in many areas. Furthermore, equipment certified to operate in the 5 GHz U-NII band can be easily adapted for operations in the 6 GHz band and the propagation characteristics for such equipment are well known. There thus would be no need for a brand new equipment research and development cycle or extensive testing before equipment can be commercially deployed.

If the Commission desires to maximize rural deployment, permitting higher-power operations in the U-NII-5 and U-NII-7 bands will promote that objective. Limiting power – especially where, as here, spectrum can be safely shared with licensees through AFC – will drive up deployment costs or, even worse, leave unserved areas on the wrong side of the digital divide.

[24] *See NPRM* at 29 ¶ 79.
[25] *Id.*

A. The Commission Should Not Limit The Locations Or Types Of Services That Can Be Offered

The Commission should not limit the use of higher-power client devices to rural and underserved areas.[26] In urban areas where congestion is often more severe, there may be a greater need for higher-power operations. While WISP operation is less common in urban areas, urban public safety users make extensive use of the 5 GHz band. Because these operations will require the use of AFC, licensed operations will still be protected, and if an urban area has sufficient congestion to make few or no outdoor frequencies available in U-NII-5 or U-NII-7, then AFC will simply not authorize interfering operations. Further, artificially limiting the locations where higher-power operations can be deployed will reduce competition in the equipment market and discourage manufacturers from making equipment available, if at all, at prices that leverage the volume of a larger market. Defining rural or unserved areas would also be difficult, inasmuch as both spectrum congestion and service requirements rarely align with existing census boundaries. The Commission has rarely, if ever, imposed rules that limit deployment of certain equipment to rural or underserved areas, and it should not do so here.

Nor should the Commission adopt rules that limit higher-power use to point-to-point operations.[27] An outdoor standard-power access point with one high-gain client device in effect acts as a point-to-point link, which would be useful for short hauls and backhaul purposes where a licensed FS link would be impractical. The Commission should not adopt rules that, intentionally or unintentionally, would limit such uses. Moreover, the AFC is capable of determining protection contours irrespective of whether the unlicensed operations are point-to-point or point-to-multipoint, and professional installation will ensure that point-to-multipoint access points and higher-power client devices are properly oriented and installed. Imposing an

[26] *See NPRM* at 29 ¶ 79.
[27] *Id.*

unnecessary and artificial limitation on use of the band will limit its utility, investment and deployment of services that can be used to provide fixed broadband access.

B. Service Rules Should Harmonize With Rules For The 5 GHz Band, With The Addition Of Automated Frequency Coordination To Protect Licensed Operations

The Commission seeks comment on power limits for access points and client devices in the U-NII-5 and U-NII-7 bands.[28] In order to maximize the utility of these bands to support investment and deployment for higher-power uses, WISPA recommends the following comprehensive spectrum access scheme for higher-power, unlicensed use of the U-NII-5 and U-NII-7 bands.

Access Point Power Limit – For standard-power access points in the U-NII-5 and U-NII-7 bands, the Commission proposes to add a new Section 15.407(a)(4) to its rules to establish a maximum conducted output power of 1 watt and maximum power spectral density of 17 dBm in any 1 megahertz band, so long as the maximum antenna gain does not exceed 6 dBi.[29] This proposed rule generally is consistent with the Section 15.407(a)(1)(i) for point-to-multipoint outdoor use of the 5150-5250 MHz band and with Section 15.407(a)(3) for the 5725-5850 MHz band.

Harmonizing the power limits for the 5 GHz and 6 GHz bands will enable equipment manufacturers to easily adapt existing 5 GHz U-NII technology and equipment to operate in the 6 GHz band. From the operator's perspective, the propagation characteristics of the 5 GHz and 6 GHz bands are very similar and well known to WISPs and other spectrum users, making deployment and coverage more certain. Harmonization also will facilitate the use of radio access technologies that allow multi-frequency operation. This could, for example, allow an access

[28] *Id.* at 29 ¶ 78.
[29] *See id.*; Appendix B.

point to operate with part of its signal on the U-NII-3 band and part of it on the U-NII-5 band. A legacy client device could then make use of only the U-NII-3 segment of the access point's capacity, while a client device also implementing the newer segment could make use of both segments. Examples of that could be LTE carrier aggregation, 802.11ac 4-chain split-frequency operation, and 802.11ax with preamble puncturing blocking the U-NII-4 segment while including parts of the U-NII-3 and U-NII-5 bands.

The rules also should preserve flexibility and allow for innovation by not adopting power spectral density ("PSD") limits that assume a Wi-Fi air interface. The *NPRM* suggests that the power spectral density for all devices be defined such that the limit per MHz is 1/20th of the total limit.[30] Thus, a standard-power access point would be allowed +17 dBm/MHz and +30 dBm/20 MHz. WISPA disagrees with this PSD limit. While pure orthogonal frequency division multiplexing ("OFDM") such as is used in 802.11{a,n,ac,ax}approximately spreads the signal evenly across the channel, that is not characteristic of all air interfaces. LTE and 5G NR, for example, use OFDM for downstream connections, but their upstream connections are based on frequency division multiplexing. The LTE upstream channel is divided into physical resource blocks, each of which is approximately 180 kHz wide and contains several OFDM subcarriers. A given end user device is then assigned some set of resource blocks, and the channel may have several end user devices transmitting simultaneously on different resource blocks within the channel. Applying an OFDM-based requirement, however, would prevent unlicensed LTE from being efficiently deployed. While WISPA is, to be sure, not fond of LTE LAA, in which unlicensed bands are used by mobile carriers only for downstream, it is the upstream that is impacted by the PSD restriction, not the downstream or LAA.

[30] *See id.* at 29 ¶ 78.

By contrast, the PSD limit for the CBRS band is applied to end user devices on a per-10-MHz basis.[31] Thus the entire +23 dBm EIRP can be applied to a small number of resource blocks, resulting in an effective PSD in the range of +23 dBm/360 kHz when only two resource blocks are in use, improving the ability of the end user device to maintain communications with its associated access point because of a potential 14 dB reduction in receiver noise.

Even in the case of pure OFDM, the 1/20th rule is unnecessarily limiting. The 802.11ac spectrum mask typically uses only 90 percent of the channel, leaving five percent at each edge as a guard band. Thus, without violating the spectrum mask on any one MHz, the maximum useful power is really only 90 percent of the nominal limit. To the extent that a PSD is defined based on the full nominal channel width, it should take into account these in-channel guard bands, and be at least one dB higher than the current model permits. But to allow greater flexibility, accommodation should be made for additional options, such as LTE or future air interfaces, with at least 6 dB more flexibility in per-MHz PSD than the Commission proposes. WISPA does not support eliminating the total conducted power limit, such as used in U-NII, in favor of only having PSD limit that would allow signals wider than 20 megahertz to have higher power.[32]

Client Devices – For fixed client devices operating in the U-NII-5 and U-NII-7 bands,[33] WISPA urges the Commission to allow a maximum conducted power of +18 dBm and up to 18 dB of antenna gain before power must be reduced (i.e., 12 dBm of additional antenna gain than is proposed in the *NPRM*, and a maximum EIRP of 36 dBm, the same EIRP as an access point). Allowing higher EIRP will increase the effective range of operations to around six miles which

[31] 47 C.F.R. §96.41(b), specifying EUD maximum EIRP dBm/10 MHz while stating the maximum PSD (dBm/MHz) as "n/a".
[32] *See NPRM* at 29-30 ¶ 80.
[33] WISPA agrees with the Commission's proposal to define "client device" consistent with the existing definition in Section 15.202 as "a U-NII device whose transmissions are generally under the control of an access point and that is not capable of initiating a network." *See NPRM* at 21-22 ¶ 54 (footnote omitted).

will enable WISPs to use the spectrum to deploy fixed wireless broadband to rural homes and businesses and to facilitate precision agriculture, IoT and other innovative services.[34]

Further, allowing higher antenna gain while keeping the conducted power limit at 18 dBm will reduce signal levels in unwanted directions. The total amount of radio frequency energy emitted by a transmitter is its conducted power. A client device with a low-gain or nearly-isotropic antenna, such as a mobile telephone, spreads its transmitter power in all directions, most of which is wasted and has a greater potential for causing interference. The more focused signal from a high-gain antenna is less likely to cause interference than a low-gain antenna.

Higher-gain client device antennas are also generally fixed in place and, for outdoor installations, are generally professionally installed. They require more skill to install than a simple omnidirectional outdoor access point because they must be aligned to face their serving access point. Many 5 GHz devices today have an antenna gain in the 25 dB range and a beam width of approximately 6 degrees. Unless the access point happens to be located close to the licensed point-to-point link, which is highly unlikely given that the AFC would not permit an access point near a licensed antenna, the high-gain client device would put very little signal in the direction of potential antennas entitled to interference protection.

Allowing a client device to operate with an EIRP of up to 36 dBm, with the proposed conducted power limit of +18 dBm, would be consistent with common operating practice in the WISP industry. Higher conducted power is not required for client devices; optimal performance typically relies on antennas with a gain even higher than 18 dB. With a 25 dB antenna, reception from the access point, the direction which typically carries more traffic, would be improved by 7

[34] Most WISPs typically use directional antennas, so the radius would be the radius of the sector, not a full circle.

dB over an 18 dB antenna and 19 dB over a 6 dB antenna. The client device with a 25 dB antenna would then be limited to 11 dBm conducted power, and thus pose even less of a risk to anything out of its boresight.

As noted above, client devices would operate under the control of the associated access point.[35] As the Commission proposes, based on the power limit and frequencies that are available from the AFC, the AFC can define an area of operation where client devices can be installed such that it is not necessary, for purposes of protecting licensed operations, for each client device to register separately with the AFC.[36]

Alternatively, for the AFC's uncoordinated-client "geofence" to remain small, fixed client devices with EIRP greater than +24 dBm could themselves query the AFC to be sure that they too are not in a location that would cause interference to an incumbent. The AFC would essentially treat the client device the same way it treats an access point, and take into account the directions in which both antennas are pointing, and potentially their patterns, so that the EIRP of the AFC-controlled antenna *in the direction of the antenna entitled to protection* as well as the receive pattern of the victim antenna in the direction of the AFC-controlled device could be used to compute the potential I/N or C/I ratio. In the case of a point-to-point link, with both ends coordinated, the usable range could be considerably farther than six miles, as high-gain antennas on both ends, even with lower conducted power, would compensate for higher path losses.

It is important for the Commission to be clear at the outset how it can avoid the chicken-and-egg question of how a higher-gain client device can query the AFC to transmit when it needs prior permission to transmit. Fortunately, there is precedent for that in the rules for TV White Space devices. Section 15.711(c)(iv) states that:

[35] *See id.* at 21 ¶ 53.
[36] *See id.* at 21 ¶ 54.

> A fixed white space device that has not yet been initialized and registered with a white space database consistent with §15.713 of this part, but can receive the transmissions of another fixed white space device, may transmit to that other fixed white space device on either a channel that the other white space device has transmitted on or on a channel which the other white space device indicates is available for use to access the database to register its location and receive a list of channels that are available for it to use. Subsequently, the newly registered fixed white space device must only use the channels that the database indicates are available for it to use.[37]

This language can be adapted to refer to fixed U-NII-5 and U-NII-7 client devices operating at greater EIRP than +24 dBm. A client device would thus query the AFC to obtain registration in the same manner as an access point would, via the access point, in order to verify the frequencies on which it is allowed to transmit. Registration with the database is a requirement of TVWS, as it should be for standard-power U-NII-5 and U-NII-7 devices.

Because they could create interference to frequencies that the AFC has marked as unavailable, active probe requests should be prohibited. The primary benefit of active probing is to allow portable or mobile devices to join or rejoin a network rapidly. This is harmless on unlicensed frequencies where there are no restrictions against transmitting on any channel. But passive probing at worst only adds a few seconds to the process and prevents transmission on unavailable frequencies, and thus should be the required method. WISP client devices do not require active probing, as they are fixed in place and typically locked to a single access point, and their frequency ranges will usually not change unless required to by the AFC.

Automated Frequency Coordination – WISPA recognizes the need to ensure that licensed services are protected from harmful interference, and therefore agrees that operation of higher-power devices in the U-NII-5 and U-NII-7 bands must be authorized through AFC.

[37] 47 C.F.R. § 15.711(c)(2)(iv).

WISPA believes that a "simple database"[38] can be developed to coordinate access before an access point can transmit. The AFC should rely on data that licensees provide to ULS.[39]

- *AFC Model* – WISPA believes that the AFC can operate under a centralized model in which a list of frequencies and parameters is maintained at a central location, or a de-centralized model in which the access point itself determines the frequency list.[40] Although the centralized model is more likely to initially attract investment and innovation given that this model has been used for TV white space and CBRS databases, equipment manufacturers should not be prohibited from developing access points that will perform the same function at the local level as an alternative to (not a replacement for) the centralized model (although, in practice, it seems unlikely that it would be a popular option). Regardless of the model, the AFC capability would be subject to certification by the Commission.

Devices would need to be tested as part of the equipment approval process to ensure that they do not use a higher power level than authorized by the AFC. When directional antennas are used, there could be more than 40 dB difference in EIRP in different directions based upon antenna orientation, so a given frequency may be usable at a given location for some sectors and high-gain antennas, but not for others. Ideally, then, the AFC should report the list of all potential frequencies, with a maximum power level for the querying device, including total exclusion of frequencies for which the allowable power level is below a certain value.

- *Determining Available Frequencies* – To promote spectral efficiency, the process to determine available frequencies in a given area should be more sophisticated than simply putting a two-dimensional exclusion zone onto a map around each protected licensee. Interference potential depends upon the EIRP of the potential interferer in the direction of

[38] *See NPRM* at 11 ¶ 25.
[39] *See id*.
[40] *See id.*

licensed end-point antennas, as well as the path loss between the two. WISPs typically use sectorized access points and highly-directional client antennas. The AFC can compute the path loss based on three-dimensional locations, and from that determine the maximum allowable power that the AFC-controlled device can use. By contrast, contours are more appropriate when the location of one end of a link is not known, as in broadcasting, or when a device is mobile. Contours may be usable for omnidirectional access points, but fixed devices require only one path loss computation to each potential victim, which should be simpler to compute than a contour. Path loss can then be adjusted for anticipated multipath and rain fade, as required.

- *Propagation Model* – The Commission observes that exclusion zones can be computed according to different propagation models.[41] WISPA strongly disagrees with FWCC in its call for free space path loss to always be used.[42] At a very minimum, a model such as ITM should be used because it takes terrain into account. Because ITM does not work well over very short distances, alternative models may be more appropriate in such cases. Such an approach was adopted for CBRS, with a blended model that uses free space for distances up to 100 meters, but uses an NTIA-defined methodology for intermediate distances and ITM for long distances. ITU-R has also developed propagation models in recent years which may prove useful, though WISPA has little if any experience with some of them in the United States. In any model, it is reasonable to take clutter into account.

Propagation prediction is in continuous development. Some proprietary models are now built using specific building locations collected across urban areas in order to optimize clutter attenuation. Some use LIDAR data to provide higher resolution than the SRTM-based elevation metrics now widely available. The most popular propagation prediction model used by WISPA

[41] *See NPRM* at 18 ¶ 48.
[42] *See id.*

members combines ITM using SRTM data with a proprietary clutter model based on the national land cover database. Rather than prescribing a specific methodology in the rules, AFCs could be permitted to select a model of their choice, provided that they demonstrate that it is sufficiently protective of incumbents. Alternatively, a multi-stakeholder group could select a standard methodology, though this may take some time. Such a group could continue to refine its methodology and allow AFCs to adopt new versions as they are developed. Hence, the Commission's question of whether propagation models for different conditions can be combined into a single model is likely to be answered in the affirmative,[43] but doing so is not easy and should not be a gating factor for making the band available for unlicensed use.

- *Device Registration* – Device registration adds a degree of complexity to the AFC but serves several useful purposes. It is unlikely to be much of a burden on AFC operators, as they may need to register their customers' devices anyway simply to be able to charge for their services on a recurring basis. Registration provides a means to resolve complaints from licensees with information about potential interferers, including instances where the AFC user provides inaccurate information. Another benefit of registration is the ability to infer potential channel loading in a given area, such as in the case of a large number of standard-power devices that exist near, but not within, the interference threshold of a protected licensee. In such situations, the AFC may adjust its parameters to limit aggregate transmission levels on the licensed frequencies. This need not approach the complexity of the CBRS SAS.

- *AFC System Operators, Certification, Requirements and Fees* – WISPA agrees with the Commission's proposal to designate multiple private entities to administer AFC systems.[44] This approach has proven to be successful in CBRS, in which the Commission

[43] *See id.* at 19 ¶ 49.
[44] *See id.* at 12-13 ¶ 33.

designated spectrum access system development to a multi-stakeholder group and elicited applications for administrators willing and able to develop, operate and maintain the database. Here, the absence of Federal incumbents, satellite receive-only facilities and mobile use, coupled with the experience of the WInnForum effort, should make the AFC development and certification process advance at a much quicker pace. Consistent with past practice, the Commission's Office of Engineering and Technology should test and certify AFCs.[45] Five-year terms for AFC administrators are acceptable.[46]

- *Protection Criteria* – The Commission seeks comment on whether to adopt protection criteria based on the ratio of interference to noise (I/N ratio) or the ratio of carrier to interference power (C/I ratio).[47] The I/N ratio model is simpler. The C/I model would require the AFC to look at both the transmitter and receiver ends of protected links. The advantage of the C/I ratio model would be a potentially higher power limit for AFC-managed users when the received signal level has a high margin. The disadvantage of C/I would be a more complex AFC and thus a potentially higher cost. WISPA can accept either of these models.

WISPA agrees that the suggested I/N of 0 dB should be a valid value.[48] Most licensed links in the 6 GHz band operate with a very high fade margin. Links are virtually all digital today, and these are required to maintain a minimum efficiency of 4.4 bps/Hz at least 99.95% of the time.[49] Only during periods of extreme rain or, more often, multipath loss, will a signal be reduced to a level near the receiver's noise threshold. Thus, the C/I ratio is much more favorable most of the time than the 0 dB I/N ratio would permit. Adopting a C/I ratio would potentially

[45] *See id.* at 13 ¶ 34.
[46] *See id.* at 13 ¶ 35.
[47] *See id.* at 15 ¶ 42.
[48] *See id.* at 16 ¶ 43.
[49] 47 C.F.R. § 101.141(a)(3).

raise the additional question of how to compute path loss, multipath fade, and rain fade, and what level to protect against.

- *Adjacent Channel Protection* – WISPA concurs that there is no need for the AFC to protect adjacent channels, at least in general.[50] The out-of-band emissions limits applicable to U-NII devices generally require a stringent emission standard such that the impact of an adjacent-channel standard-power transmitter is unlikely to exceed that of a co-channel low-power transmitter, much less a higher-power, adjacent-channel licensed link. Under the Commission's proposal, an uncoordinated low-power device would be limited to indoor operation at 6 dB less power than a standard-power device, and building penetration loss is likely to approximate 20 dB. Section 15.403(i) defines emission bandwidth in terms of 26 dB below the maximum level of the radiated carrier. A 26 dB emission bandwidth is also cited in Section 15.407(a)(2) for defining the power limit of U-NII-2 devices. With a 26 dB threshold, the adjacent-channel emission of a standard-power outdoor device is at worst equivalent in impact to an indoor low-power device. It would not, however, be unreasonable to require a minimum emission mask that ensures that in-band out-of-channel emissions are well below in-channel emissions, or to require the AFC to leave a small additional guard band for equipment that does not comply with a 26 dB standard for adjacent-channel suppression.

- *Access Point Location and Height* – Geolocation using GPS is well established for outdoor devices. Many outdoor access points used by WISPA members already incorporate GPS for timing purposes in order to synchronize sectors, and some radio access technologies, including LTE, presume GPS timing. Such devices can, especially when outdoors, reliably transmit their latitude and longitude coordinates to the AFC. However, in cases where the access point equipment does not include internal GPS functionality, WISPA recommends that the

[50] *See NPRM* at 16 ¶ 44.

Commission be permitted to certify external GPS receivers to provide synchronization to multiple collocated sectors. If the Commission's certification process does not ensure adequate geolocation through either of these means or if the AFC cannot determine frequency availability because GPS is blocked by terrain or other obstructions,[51] then professional installation would be warranted.

Determining horizontal location accuracy to within one second, the same precision required of Part 101 devices[52], is not difficult. As the Commission observes, however, determining elevation accuracy is more challenging.[53] If a device depends on geolocation to report its elevation to the AFC, and particularly if it is not professionally installed, then the AFC may need to apply a margin of safety to account for that imprecision. Assuming that the AFC requires registration, then location should be registered, including elevation. Registration information need not be made available to the general public, though making it available to nearby licensees may be useful for resolving questions of interference.

The Commission should not set an absolute maximum height on access points.[54] The typical WISP access point is higher than a typical Wi-Fi access point, as the latter is aimed at users in its immediate environs, while a WISP access point is generally a sector intended to be used by fixed clients up to several miles away and thus needs to be located above nearby obstructions. In wooded areas, a WISP access point generally needs to be above the tree canopy. In urban areas, it is generally on one of the higher rooftops in the immediate vicinity. In sum, artificial restrictions on the maximum height would unnecessarily impair some operations that might be permitted by the AFC based on its ability to determine protection. For example, in a

[51] *See id.* at 19 ¶ 50.
[52] 47 C.F.R. § 101.21(e)
[53] *See NPRM* at 20 ¶ 52.
[54] *See id.* at 20 ¶ 51.

rural area, a WISP may have access to a grain leg 35 meters high. The antenna could not mount below its top because the silos that surround it would block the signal. A WISP may also be located on a tower on a mountainside, with the mountain completely blocking the signal in one direction, while the higher location on the tower may be necessary to reach some customers across the terrain, or to facilitate a separate backhaul link to the tower. If a WISP rents a vertical space on a tower, it would not be economical to rent a second, lower one simply to meet an arbitrary height restriction.

Just as a two-dimensional exclusion zone would be insufficiently flexible as a mechanism for protection, a maximum height limit is not appropriate when only a single point-to-point interference path needs to be calculated by the AFC. Contours associated with limited height may be more appropriate for mass deployment of omnidirectional access points, but should not override actual path computations. Another factor mitigating potential harm from higher elevations is that these higher WISP access points are far less numerous than higher-volume RLAN devices, as they are spaced to provide coverage to client devices with high-gain antennas, not portable/mobile devices. Thus they pose less aggregate risk of interference.

- *Professional Installation* – WISPA believes that professional installation should be required for higher-power client devices unless the device is able to determine with sufficient precision the orientation and elevation of the access point.[55] At present, while the AFC can identify frequency availability based on the directionality of the access point being registered, there can be no assurance that the access point is actually installed as permitted by the AFC. Similarly, the AFC may permit certain frequencies to be used up to a maximum elevation, but there can be no assurance that the access point is installed at that height (or a lower height).

[55] *See id.* at 20-21 ¶ 52. Professional installation should not be required for lower-power devices.

Professional installation is required for many devices on the 5 GHz band[56] and WISPs well understand and are comfortable with the obligations associated with professional installation.

Although the majority of WISP devices, including sectorized access points and client devices with highly-directional antennas, are typically installed by the operator, that may not be the case in every instance. Particularly in the case of access points with omnidirectional antennas and geolocation capability, the device itself may be able to provide sufficient information to the AFC. Future beam-steering devices, particularly high gain client devices, may also be able to operate directionally without manual intervention. To the extent that professional installation is required for U-NII-5 and U-NII-7 devices, professional installation should use a similar standard to Part 15 requirements and not require a specific certification process. Accordingly, the Commission should require professional installation only to the extent that the access point directionality and elevation accuracy are not otherwise accurate to a certain safe margin. This will allow professional installation to be eliminated in those cases where it is not necessary to ensure interference protection, without the need for the Commission to initiate a new rulemaking proceeding.

- *Unwanted Emissions* – The emission mask cited in the RKF report, and referred to in the *NPRM*, is the 802.11ac mask, which represents a reasonable compromise between signal purity and cost, and is not difficult for high-quality Wi-Fi and WISP equipment to incorporate.[57] Specifically, it assumes that full power spectral density only extends to 1 megahertz away from the channel edge, that it is reduced by 20 dB at 1 megahertz outside of the

[56] The Grant of Equipment Authorization for numerous devices contains the phrase, or an equivalent, "Professional installation is required." *See, e.g.*, SWX-NBE5ACG2W at https://apps.fcc.gov/oetcf/tcb/reports/Tcb731GrantForm.cfm?mode=COPY&RequestTimeout=500&tcb_code=&application_id=5ESoMyuDIUdWlmikBiKQMQ%3D%3D&fcc_id=SWX-NBE5ACG2W (last visited Feb.7, 2019).
[57] *See NPRM* at 30-31 ¶ 83.

channel edge, and that it is reduced by at least 28 dB at a distance from the channel center equal to the channel width (e.g., the center of an adjacent equal-sized channel). A suppression of 40 dB is required one and a half times the channel bandwidth away from its center (e.g., 30 megahertz from the center of a 20 -megahertz channel, or at the distant edge of an adjacent same-sized channel). If this mask is adopted as the requirement, in addition to the proposed out-of-band emission limits, the AFC can use it to estimate how close a signal may be to a protected signal. This Wi-Fi mask does result in somewhat wider guard band requirements than a strict 26 dB requirement at the channel edge.

- *Additional Mitigation Measures* – WISPA disagrees that standard-power devices should be required to periodically transmit identifying information to help mitigate the potential for interference.[58] As an initial matter, and as the Commission observes,[59] existing 5 GHz U-NII equipment does not require identifying information to be transmitted. To add this requirement would drive up equipment costs and delay the introduction of devices certified to operate in the U-NII-5 and U-NII-7 bands, thus slowing the pace and increasing the cost of deployment. Moreover, the utility of transmitting identifying information has not been proven as an effective interference mitigation measure. WISPA agrees with FWCC that requiring higher-power devices to transmit identifying information does not help pinpoint the cause of interference.[60]

WISPA agrees with the Commission that the AFC should record the actual frequencies being used by each standard-power access point.[61] This provides the first line of protection should interference be noted by a licensee. Given that there are likely to be many competing AFCs, some mechanism may be required to allow for all AFCs to communicate with a central

[58] *See id.* at 31-32 ¶¶ 87-88.
[59] *See id.* at 31 ¶ 88.
[60] *See id.* at 31 ¶ 87.
[61] *See id.* at 32 ¶ 89.

clearinghouse, if not with each other, so that band-in-use information can be obtained from one query, which could in turn query all AFCs, or at least all AFCs known to be operating in a given area.

- *Informational Requirements* – Informational requirements for devices are also desirable to provide users with guidance as to how and where such devices should be utilized.[62] Low-power devices that do not query the AFC should be labeled for indoor use only, on the device, in its user manual, and on the packaging. Devices requiring professional installation should also be so labeled accordingly, and the user manual should be required to state the relevant operational requirements and restrictions.

III. THE COMMISSION SHOULD ALLOW UNLICENSED OPERATIONS IN A PORTION OF THE U-NII-8 BAND

The Commission proposes to allow unlicensed operations in the U-NII-6 and U-NII-8 bands, but would restrict such unlicensed use to lower power, indoor operations.[63] WISPA recommends that the Commission revise this proposal to allow higher-power unlicensed operations in the lower 100 megahertz of the U-NII-8 band consistent with the U-NII-5 and U-NII-7 bands. The Commission has determined that standard-power unlicensed operations – both outdoor and indoor – can coexist with licensed operations in the U-NII-5 and U-NII-7 bands through the use of AFC under the parameters discussed in detail above. For the same reasons, WISPA suggests that such operations would also pose little, if any, threat to existing licensed operations in the lower 100 megahertz of the U-NII-8 band where there are no authorized BAS TV pickup licensees and where there has not been significant investment in mobile BAS operations.

[62] *See id.* at 32 ¶ 91.
[63] *See id.* at 23-27 ¶¶ 59 -72.

Allowing standard-power unlicensed outdoor operations in the lower 100 megahertz of the U-NII-8 band under the same parameters as those for the U-NII-5 and U-NII-7 bands would effectively open up an additional 160-megahertz channel comprised of a combination of the U-NII-7 and U-NII-8 bands, thus further promoting investment in and the deployment of new technologies and services "that will advance the Commission's efforts to make broadband connectivity available to all Americans, especially those in rural and underserved areas."[64]

IV. THE COMMISSION SHOULD AUTHORIZE LOWER POWER OPERATIONS THROUGHOUT THE 6 GHz BAND

The Commission proposes to allow lower power, indoor operations on an unlicensed basis in the U-NII-6 and U-NII-8 bands and requests comment on whether to allow similar low-power operations in the U-NII-5 and U-NII-7 bands as well.[65] WISPA supports these proposals and urges the Commission to make the entire 6 GHz band available for lower-power operations to support Wi-Fi and other consumer uses.

As the Commission states in the *NPRM*, "[u]nlicensed Wi-Fi wireless routers provide the crucial link between many users' devices and the Internet."[66] According to the *NPRM*, "76 percent of North America broadband households use Wi-Fi routers as their primary connected technology" and Wi-Fi connectivity is widely – and increasingly – available to consumers in places where people gather, such as restaurants, hotels and shopping centers.[67] The *NPRM* further describes how the deployment and use of unlicensed wireless devices operating on a variety of unlicensed wireless standards – such as Wi-Fi, Bluetooth, and LTE-U – is projected to grow almost exponentially over the next few years to meet the needs and demands of consumers,

[64] *Id.* at 1 ¶ 1.
[65] *See id.* at 23 ¶ 59 and 27 ¶ 73.
[66] *See id.* at 3 ¶ 5.
[67] *Id*.

the burgeoning IoT, and other innovations.[68] However, the spectrum that is currently available for these unlicensed applications is becoming increasingly congested, and additional spectrum must be made available for lower-power, unlicensed use.

Allowing lower-power unlicensed operations across the entire 6 GHz band would make up to 1200 megahertz of additional spectrum available to support broadband connectivity and a variety of other high throughput and low latency applications for residences and businesses across America, thus promoting consumer access to broadband and encouraging innovation in new technologies, services, and applications. In addition, allowing lower-power use across the entire 6 GHz band will make coordination easier by making more spectrum "parking spots" available for unlicensed devices. Furthermore, the U-NII-6 band is only 100 megahertz wide, so devices operating there would not be able to operate using, for example, the 160-megahertz channels available in 802.11ax unless they also have access to the adjacent U-NII-5 or U-NII-7 bands. Such a wide signal would have a low risk of interference because its PSD spectral density would be low, being spread across a wider spectrum.

The Commission is proposing to allow lower-power unlicensed devices to operate in the U-NII-6 and U-NII-8 bands without the need for authorization from an AFC system, based on its determination that such operations will not cause interference to incumbent licensed services in these bands.[69] WISPA believes that, for much the same reason, lower-power operations are not likely to interfere with higher-power or incumbent licensed operations in the U-NII-5 and U-NII-7 bands either, and should therefore be permitted without AFC in these bands as well. In particular, WISPA agrees with the assessment by Apple and Broadcom that the combination of low power levels, indoor-only operation, antenna design, and building attenuation suggest that

[68] *See, e.g., id.* at 2-4 ¶¶ 3-7.
[69] *See id.* at 23-27 ¶¶ 59-72.

lower-power unlicensed operations would not result in interference to higher-power licensed and unlicensed operations in the U-NII-5 and U-NII-7 bands.[70] In any case, unlicensed operations, including those authorized via AFC, are not entitled to protection against other unlicensed operators. Accordingly, WISPA urges the Commission to make the entire 6 GHz band available for lower-power operations.

Conclusion

The Commission should be commended for initiating this proceeding seeking comment on ways that 1200 megahertz of the 6 GHz band can be shared for unlicensed use. In particular, the Commission should make the U-NII-5 and U-NII-7 bands available at higher power to facilitate outdoor use under the control of the AFC and with the technical requirements described above. With such rules in place, WISPs can take great strides to helping extend broadband access to more rural and unserved areas with less threat of harmful interference, and without causing interference to licensed links. The Commission also should adopt rules enabling lower-power indoor operations across the entire 6 GHz band.

Respectfully submitted,

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[70] *See id.* at 27 ¶ 73, *citing, e.g.*, Apple Inc., Broadcom Inc., et al. *Ex Parte* Letter (filed Aug. 2, 2018), at 9.