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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 Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

COMMENTS OF THE DYNAMIC SPECTRUM ALLIANCE

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June 29, 2020

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I. INTRODUCTION AND SUMMARY

The Dynamic Spectrum Alliance ("DSA") [1] is pleased to submit these Comments *In the Matter Unlicensed Use of the 6 GHz Band.* [2] DSA applauds the Federal Communications Commission's (FCC or Commission) thorough and technically sound conclusions in the *Order* in permitting fixed operation of low power indoor (LPI) and standard power unlicensed devices under control of an Automated Frequency Coordination (AFC) system. The Commission is correct to regard its work as incomplete given the primacy of portable and mobile use cases in driving the innovation and economic benefits of Wi-Fi in the United States.

DSA strongly supports further action on the questions raised by the FNPRM, in particular to permit the operation of Very Low Power (VLP) portable devices of up to at least 14 dBm EIRP, mobile standard power devices under AFC control up to 36 dBm EIRP, and to increase the allowable power for fixed LPI devices to 8 dBm/MHz.

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

[2] *Unlicensed Use of the 6 GHz Band*, Report & Order and Further Notice of Proposed Rulemaking, FCC No. 20-51, ET Docket No. 18-295, GN Docket No. 17-183 (rel. Apr. 24, 2020) ("*6 GHz R&O and FNPRM*").

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II. VERY LOW POWER OPERATION

The Commission's 6 GHz Report and Order laid a strong foundation for wireless innovation by making 1200 megahertz of spectrum available for unlicensed use. However, to realize the full potential for innovation in the 6 GHz band, the Commission should open the full band to portable use. Therefore, DSA supports the Commission's proposal in its Further Notice of Proposed Rulemaking, which seeks comment on a new device class: "very low power" (VLP) portable devices that would operate both indoors and outdoors across the 6 GHz band. The Commission should permit VLP devices throughout the 6 GHz band at 14 dBm EIRP at 1 dBm/MHz power spectral density EIRP. This very low power level combined with factors such as body loss, itinerancy of VLP devices, and environmental clutter will allow the small percentage of VLPs that are expected to actually operate outdoors at any given time to share spectrum with incumbent services without causing harmful interference.

A VLP portable device class would enable a new range of immersive, real-time applications and personal area network, wearable, and in-vehicle portable devices. For example, these devices will allow immersive services such as augmented reality and virtual reality (AR/VR) and gaming. AR/VR devices will be used to enhance collaboration, training, and productivity through AR/VR business applications. AR glasses used as mobile peripherals could provide consumers with a number of immersive applications such as "heads-up" displays, alerts and information in real-time. And in automotive settings, VLP portable devices will be used for peer-to-peer streaming, immersive location, and infotainment.

To make these anticipated use cases a reality, a power of at least 14 dBm EIRP and 1 dBm/MHz "power spectral density" (PSD) is necessary. This power level represents the minimum power level needed to enable VLP devices to support these potential use cases reliably. A key factor for portable, battery-powered devices is optimizing the tradeoff between the desired user experience and power consumption. Due to body loss in wearable devices and other expected losses, a lower maximum power level will result in lower data rates, which, in turn would lead to increased latency and higher duty cycles. Increased latency would degrade latency-sensitive applications like AR/VR as well as other time-sensitive applications. And high duty cycles drain battery power and reduce the utility of portable devices.

Sharing spectrum with incumbent fixed links is feasible even when VLPs are operating outdoors because VLP operations are significantly different from "Low Power Indoor" (LPI) operations.[3] First, VLPs operating outdoors are anticipated to be body-worn portable devices, subject to significant body loss. This body loss impacts not just the link between the VLP device (such as AR glasses) and a mobile phone, but it also reduces the energy from the AR glasses toward the fixed link. And in scenarios where body loss may be lower, transmit power control (TPC) will reduce the VLP's transmit power below 14 dBm EIRP in order to preserve battery life. Similarly, in-vehicle VLPs would be subject to significant loss due to the vehicle itself before impacting the fixed link. Second, because VLPs used outdoors would be wearable devices, VLP devices would be itinerant and in motion on the person outdoors rather than

[3] *See 6 GHz R&O and FNPRM* ¶ 235.

stationary, further decreasing the probability that a VLP would be located in an area long enough to impact a fixed link. Third, VLPs operating outdoors would be subject to substantial signal losses in the direction of incumbent receivers caused by environmental clutter (such as from natural or man-made structures adjacent to sidewalks and pathways where people wearing or carrying VLPs would be outdoors). And fourth, less than 10 percent of VLP devices are likely to not be indoors. Studies of human activity patterns show that people spend only an average of approximately 6% of their time outdoors, not in a vehicle, and approximately 4% of their time in cars.[4] These factors taken together make sharing between VLPs and incumbent users in the 6 GHz band feasible without further mitigation needed.

III. THE COMMISSION SHOULD PERMIT LOW POWER INDOOR DEVICES TO OPERATE THROUGHOUT THE 6 GHz BAND WITH A POWER SPECTRAL DENSITY LIMIT OF 8 dBm/MHz

The Commission seeks comment on whether to increase the maximum radiated power spectral density ("PSD") for LPI devices operating in the 6 GHz band from 5 dBm/MHz (with a maximum permissible EIRP of 30 dBm when a device uses a bandwidth of 320 megahertz) to a

[4] *See* Environmental Protection Agency, *Report on the Environment: Indoor Air Quality*, https://www.epa.gov/report-environment/indoor-air-quality#note1 (last visited June 28, 2020) ("Americans, on average, spend approximately 90 percent of their time indoors . . ."). Of the 10 percent spent outdoors, approximately 4 percent is spent in vehicles. *See* Federal Highway Administration, *2017 National Household Travel Survey: Summary of Travel Trends*, Department of Transportation, 54 (2017), https://nhts.ornl.gov/assets/2017_nhts_summary_travel_trends.pdf.

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higher PSD of 8 dBm/MHz (with a maximum permissible EIRP of 33 dBm for devices operating in a 320 megahertz bandwidth).[5] As the *FNPRM* notes, this higher power level "would be useful for many indoor devices that require high data rate transmissions such as indoor access points communicating with clients like high-performance video game controllers, and wearable video augmented reality and virtual reality devices."[6]

The DSA agrees that high performance, next-generation Wi-Fi devices requiring high data rate transmissions will benefit from the higher PSD limit for LPI operations throughout the 6 GHz band. Increasing the PSD limit for LPI devices will allow 6 GHz Wi-Fi networks to provide better Wi-Fi performance for consumers and ensure that the 6 GHz band will be used to its full potential. The key differences between an LPI access point with a 5 dBm/MHz PSD and an 8 dBm/MHz PSD are: (1) coverage area and (2) throughput in the covered area. As CableLabs explained, relative to a PSD of 8 dBm/MHz, the current 5 dBm/MHz limit *reduces* Wi-Fi coverage by 31-43 percent and throughput by 53-63 percent, on average.[7] Using the Commission's PSD scaling factor, the impact of this lower PSD limit is even more pronounced at smaller channel bandwidths, where the EIRP levels are lower. Additionally, client devices operating under the control of an LPI access point have a PSD limit of -1 dBm, with an EIRP limit of 24 dBm. Taken together, at current LPI power levels, there may be locations within a

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[5] See FNPRM at ¶ 244.

[6] Id.

[7] See Letter from Rob Alderfer, Vice President of Technology Policy, CableLabs to Marlene H. Dortch, FCC, ET Docket No. 18-295, GN Docket No. 17-183, at 4-5 (filed March 30, 2020).

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residence or business where an indoor client device may not be able to successfully communicate with the indoor access point to close the link, let alone with the minimum throughput necessary for a high-performance application. Either consumers must accept that certain parts of their residence or business can't be used for the 6 GHz Wi-Fi or they will have to incur additional costs for purchasing and installing additional access points or extenders to achieve the same Wi-Fi performance that have come to expect today. Increasing the PSD limit to 8 dBm/ MHz will enable consumers to enjoy the full benefits of next-generation Wi-Fi without imposing additional, unnecessary costs.

Most significantly, the record clearly shows that increasing the PSD for LPI devices to 8 dBm/MHz will not cause harmful interference to incumbent Fixed Service or Broadcast Auxiliary Service operations in the 6 GHz band. CableLabs submitted detailed technical analyses that modeled the interference potential of LPI unlicensed devices to microwave receivers and to BAS transmissions and provided subsequent sensitivity analyses.[8] These detailed analyses demonstrate that, even at a higher PSD of 8 dBm/MHz, LPI devices will not cause harmful interference to incumbent operations in the 6 GHz band.[9] The Commission found the

[8] CableLabs Dec. 20, 2019 *Ex Parte*; CableLabs Feb. 14, 2020 *Ex Parte* at 5-7.

[9] Technical analyses submitted by other parties likewise confirmed these conclusions. See, e.g., Letter from Paul Margie, Counsel to Apple, Inc., Broadcom Inc., Facebook, Inc., Hewlett Packard Enterprise, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, Docket No. 17-183, at Attachment (filed Jan. 25, 2018) (RKF Study); Letter from Paul Caritj, Counsel for Broadcom Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, at Attachment (Mar. 29, 2019); Letter from Paul Margie, Counsel to Apple, Inc., Broadcom Inc., Cisco Systems, Inc., Facebook, Inc., and Hewlett Packard Enterprise, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183, at Attachment (filed June 24, 2019); Letter from Apple Inc., Broadcom Inc., Cisco Systems Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Marvell

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CableLabs' analyses of FS links, in particular, to be "persuasive" and "the best evidence in the record of the impact that unlicensed low-power indoor devices will have on incumbent operations—and it demonstrates that such operations will not cause harmful interference."[10]

The Commission's own technical analyses also acknowledge that a negligible amount of interference in one instance should not preclude LPI operations at a particular power level. When considering the five "worse case[] FS link scenarios,[11] the Commission found, at a PSD of 5 dBm/MHz, that "In only one case does a static link budget analysis suggest a nontrivial possibility of harmful interference (Case 5) [i.e., in excess of -6 dB I/N], and we do not believe this one case poses a significant potential for actual harmful interference."[12] Indeed, the Commission noted that it was "not, however making a determination that any signal received with an I/N greater than -6 dB would constitute 'harmful interference,'" and further stressed the number of real world factors that made the probability of harmful interference even more remote.[13]. When analyzing these FS links with a 8 dBm/MHz PSD limit, the Commission again concluded that this "would create a higher risk of harmful interference (*although still very*

Semiconductor, Inc., Microsoft Corporation, Qualcomm Incorporated, and Ruckus Networks to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183, at Attachment (filed July 5, 2019).

[10] See R&O at 118.

[11] See R&O at 130

[12] See R&O at 131.

[13] See R&O footnote 337.

low)."[14] Here too, there was only one case, Case 5, that exceeded the interference protection criteria. When overlaying the same real world factors that the Commission analyzed when adopting the current 5 dBm/MHz PSD, the risk of harmful interference at a 8 dBm/MHz PSD dissipates even for these worst cases.

Moreover, to the extent concerns remain about increasing the PSD limit, the contention-based protocol requirement that the Commission has established for LPI devices will provide additional protections for incumbents. Thus, the Commission can, and should, increase power limits for LPI devices and it can do so while still ensuring that incumbents remain protected from harmful interference.

IV. MOBILE STANDARD POWER ACCESS POINTS UNDER AFC CONTROL CAN OPERATE AT UP TO 36 dBm EIRP IN THE U-NII-5 AND U-NII-7 BANDS WITHOUT INCREASING THE RISK OF HARMFUL INTERFERENCE

DSA enthusiastically welcomes the Commission's decision in the *Order* to permit fixed standard power APs under control of an AFC system. Indeed, AFC has been the least controversial aspect of the 6 GHz proceeding, with virtually all incumbent commenters agreeing that AFC is a viable approach for facilitating standard-power operations while protecting incumbents.[15] The rules adopted in the *Order* heed the DSA's call in our Reply Comments that

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[14] See R&O at 132.

[15] Comments of the Fixed Wireless Communications Coalition at 13, ET Docket No. 18-295, GN Docket No. 17-183 (filed Feb. 15, 2019) (FWCC Comments).

"the Commission can best fulfill the promise of the 6 GHz band not by attempting to prescribe detailed command-and-control regulations on the specifics of AFC operation. Instead, it should adopt flexible, ends-oriented rules that both rigorously protect incumbents while allowing a diversity of AFC operators and models to flourish."[16] The Commission should now extend this philosophy to the vital area of mobile standard power operation under AFC control. As the leading global trade organization dedicated to dynamic shared access to spectrum including the successful development of technical and policy frameworks in countries around the world, DSA is uniquely qualified to respond to the Commission's questions in the *Further Notice*.

The Commission now asks whether to allow standard-power access points, under AFC control, to be used in mobile applications under rules similar to those for personal/portable white space devices ("WSD") and whether permitting mobile AFC operation can be done while maintaining rapid market adoption of 6 GHz devices. The answer to both questions is yes. The DSA urges the Commission to allow mobile standard power access points under AFC control as it will support important mobile Wi-Fi applications deployed today and provide innovators a means for developing solutions for yet imaginable mobile use cases. Use cases include but are not limited to transportation systems (Wi-Fi on public buses, private buses, and school buses; intercity rail and light rail; public and private ferries), transportation operations and logistics facilities (rail yards and maintenance depots, air fields and maintenance hangers, ship yards and

[16] DSA Reply Comments at 1

ports), campuses (educational, corporate, military bases, industrial areas, etc.), agriculture and food processing, extractive industries, and construction sites.

An AFC system will ensure that mobile standard power access points present a minimal risk of harmful interference to the microwave fixed link receivers operating in the U-NII-5 and U-NII-7 bands. The Commission has already authorized personal/portable white space device use not only on frequencies allocated to broadcast television, but also on frequencies allocated for public safety and other mobile licensed use based on the Commission's "high degree of confidence that the databases can reliably protect [these] operations," because "[p]ersonal/portable devices [that] rely on database access to determine their list of available channels … can protect [incumbents] in the same manner as fixed devices." [17] This conclusion is even more true of the U-NII-5 and U-NII-7 bands because the Universal Licensing System already has "extensive technical data for site-based licenses" that includes receiver locations and other detailed characteristics[18] as opposed to white space device operations where the precise location of incumbent receivers are unknown. As a result, the fixed standard-power AFC rules the Commission adopted in the R&O provide a sound functional basis for successfully implementing mobile AFC and AP operations.

[17] *Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37*, Report and Order, 30 FCC Rcd. 9551 ¶ 88 (2015).

[18] *6 GHz R&O and FNPRM* ¶ 30.

Based on our understanding of the centralized AFC system and some of our members' deep experience with TV White Spaces Databases[19], there is no reason to believe that mobile standard power access points would lead to delay in the development and certification of AFC systems or that they will "make the AFC system overly complicated." [20] This is because (1) the functions performed by an AFC are substantially similar for both the fixed and mobile cases; (2) implementing mobile standard power functionality is optional for both the AFC operator and device manufacturers; (3) most of the work to implement mobile standard power APs rests with the AP manufacturer, rather than the AFC system operator; and (4) many of the anticipated implementations will be in the form of a static geo-fenced areas which these devices never leave, or precalculated areas that can be chained together by devices in motion. If there are concerns that this additional functionality will significantly increase AFC systems' time to market, the Commission might consider making mobile standard access points its own category of access point and permit AFC's the option of including this feature.

Having recently submitted comments and reply comments in the 'Unlicensed White Space Device Operations in the Television Bands' proceeding that includes a proposal to permit a higher power WSD operations on mobile platforms within a geofenced area[21], the DSA does not recommend that the Commission base these rules exclusively on personal / portable WSDs.

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[19] Link to Michael C.'s database paper done for DSA

[20] *6 GHz R&O and FNPRM* ¶ 250.

[21] See Comment and Reply Comments of DSA in

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The Commission should borrow some regulatory concepts from fixed personal / portable WSDs, fixed WSDs, and combine these with elements unique to the AFC as suggested below to create ends-oriented rules that both rigorously protect incumbents while allowing a diversity of AFC operators and models to flourish.

First the Commission must define the mobile standard power access point in 47 CFR 15.407 (a). Next, the mobile standard power access point should have the same conducted power, EIRP, and PSD limits as a standard power access point. Because mobile AFC systems will employ the same core methodology and fixed incumbent data they will simply build on the existing fixed AFC spectrum availability determination methodology by incorporating various degrees of location uncertainty and frequency availability optimizations over larger areas, as appropriate. There is no technical justification or need to reduce power levels.

The Commission asks whether "additional information needs to be communicated … to identify whether a device is fixed or mobile." [22] This is not necessary because the AFC can use the already required FCC ID and unique manufacturer serial number to differentiate between mobile standard power access points and standard power access points.

DSA wishes to clarify the Commission's supposition that "such devices would need … an integrated connectorized antenna" which appears to be an inadvertent oxymoron. [23] Mobile standard power access points must be able to use either fully integrated or external connectorized

[22] *6 GHz R&O and FNPRM* ¶ 250.

[23] *6 GHz R&O and FNPRM* ¶ 248

antennas. Integrated antennas may well suffice for providing service to users inside a public transit vehicle such as a bus or a rail car. However, the vast majority of such deployments today require that the access point be concealed for aesthetic and anti-tamper reasons, and connected to purpose-built antennas via coaxial cable. Even more critical are roof-mount antennas for mobile APs on construction equipment, mobile cranes, farm equipment, police cars, and buses to provide mobile hotspot coverage bubbles as well as wireless backhaul via AP-to-AP mesh technology while in motion. These antennas have special designs and ratings to handle considerations such as water intrusion, vibration, and wind loading. Certain applications also require directional coverage, such as the roof-mount antennas on subway and rail cars which have sharply directional patterns to the front and rear of a train to maximize connection time to trackside infrastructure. Permitting mobile connectorized antennas represents no increase in complexity for the AFC, which is already calculating the actual antenna pattern for each fixed service receiver.

Then, the Commission should apply the geofence concept from personal / portable WSDs to mobile standard power access points operating in the U-NII-5 and U-NII-7 bands.

> "A mobile standard power access point may load channel availability information for multiple locations, (i.e., in the vicinity of its current location) and use that information to define a geographic area within which it can operate on the same available channels at all locations. For example, a mobile standard power access point could calculate a bounded area in which a channel or channels are available at all locations within the area and operate on a mobile basis within that area. A mobile standard power access point using such channel availability information for multiple

> locations must contact the AFC again if/when it moves beyond the boundary of the area where the channel availability data is valid.[24]

Geofenced areas will be one of the most common applications of mobile standard power APs, and existing use cases are almost too numerous to count. Industry-specific applications well-suited to geofence operation include construction sites, container ports, railyards, oil fields, outdoor mines and farms, all of which already run their day-to-day operations on a bounded perimeter basis. Most university campuses and airport properties include shuttle buses that run defined routes that can be defined without ever leaving a polygonal area. One important feature of a geofence for 6 GHz Wi-Fi operation will be the ability to scale to accommodate a wide range of areas; for example, from several acres for a typical construction site up to several square miles for a mine, oil field, or farm.

In order to define the geographic area, the mobile standard power access point must have incorporated geo-location capability and be able to report to the AFC system its position and error in its position at a 95 percent confidence level. The mobile standard power access point must check its geo-coordinates periodically while in operation to ensure that it is still within the geofence. Rather than having a set geo-coordinate recheck time, it might be better to have the recheck time based on the mobile platform's proximity to the edge of the geofence and the velocity, if any, of the mobile platform. Initially, the Commission may want to consider a buffer zone between within the geofence where the mobile standard power access point must contact

[24] See 47 CFR 15.711(d)(5).

the AFC, which in turn would indicate back to the access point that the previously available frequencies are no longer available. However, the method by which a mobile standard power AP determines its proximity to the edge of the geofenced area must not be so conservative as to preclude the ability to operate small protected areas. In practice, a square block is a reasonable lower bound for a geofenced area (approximately 2 acres).

Conceivably, the AFC could calculate a new geofence with a list of available frequencies and maximum EIRP levels on the fly. The mobile standard power access point should have to contact the database daily to ensure that the frequencies within the geofence remain valid (but allow it to contact the AFC more frequently if it needs to modify the geofence). The geofence can be defined either by a polygon (of a to be determined number of points) or a circle and a radius.

However, in keeping with DSA's guidance that the Commission should balance existing white space rules with the unique requirements of the Wi-Fi ecosystem, there are two other bounding techniques that should be permitted: precalculated areas, and realtime areas. The defining characteristics of a geofenced areas are (1) there is a single common spectrum availability result that applies to the entire area; and (2) that the mobile AP is not free to leave the geofenced area. By contrast, precalculation can be a particularly beneficial approach for mobile standard-power AP deployments operating with geographically-constrained motion, such as along railways and roadways where spectrum availability could vary significantly along the route. For example, mobile APs deployed in rail cars would be geographically constrained by the path of the tracks, allowing the mobile AFC to precalculate frequency availability along the geographically-narrow line of a long distance route, with minimal uncertainty in side-to-side location. AFC systems can precalculate frequency availability for a defined geographic area using sizes that are appropriate for localized topographic variability and expected vehicle velocity based on the existing technical rules for fixed APs.

For mobile applications with significant freedom of operation, such as rubber-wheeled vehicles on city streets or highways, an AFC system that performs real-time calculations based on current location with an appropriately dimensioned uncertainty may be the most appropriate solution. For these cases, a mobile standard-power AP with a limited backhaul connection might choose to provide its geolocation information to the mobile AFC with a higher degree of uncertainty than it is otherwise capable of determining in order to reduce the frequency with which it must check in with the AFC system, even if this means reduced spectrum availability. Alternatively, a mobile AP with high speed backhaul connectivity might elect to contact the AFC system more frequently and report a much smaller uncertainty in order to improve the AFC system's calculation of spectrum that is available to the access point.

Regardless of which of these three modes of operation is appropriate to a given usage, there may be tradeoffs between the mobile standard power access point's EIRP level, available frequencies, and bounding method. That is, hypothetically, a mobile standard power access point may have access to more frequencies within the bounding area if it operates at 30 dBm EIRP rather than if it seeks to operate at 36 dBm. As mentioned above, there may also be situations where a change in the magnitude of the uncertainty may lead to a difference in the list of available frequencies and their maximum EIRP level.. The Commission should adopt a flexible, ends-oriented framework that incentivizes innovation within the existing clear boundaries it has already established to protect incumbents via AFC systems.

V. CLIENT DEVICES SHOULD BE PERMITTED TO CONNECT TO OTHER CLIENT DEVICES WHILE INDOORS

The Commission clearly stated that "When a client device is under the control of a low-power indoor access point, it should also be indoors and in close proximity to the access point, and therefore avoid presenting an interference risk to licensed services".[25] LPI access points and their clients will be able to operate throughout the 6 GHz band. The Commission was rightly concerned about client devices transmitting outdoors where there is a greater chance that they may cause harmful interference to fixed and mobile incumbent operations. It thoroughly remedied this concern by requiring client devices to be 6 dB below the power of their associated access point.

However, the Commission imposed an additional and unnecessary remedy that prohibits client devices from connecting directly to another client device.[26] DSA members are aware of multiple use cases in other unlicensed bands that require client-to-client connectivity. It means

[25] See R&O at ¶ 199.

[26] See 47 C.F.R. §15.407(d)(5).

that applications such as screen-casting from one client device to another could not occur even indoor over frequencies in the 6 GHz band.

The DSA believes that the mechanism that the Commission has put in place -- permitting a client device to send a probe request to an access point after it has detected a transmission from the access point on the same frequency at the access point's transmission[27] – can be extended to allow client-to-client connectivity in an manner that does not increase the risk of causing harmful interference. The Commission rationale for allowing the "probe exception" is that "…the client device will have to detect an access point transmission, the client device will only transmit when it is close enough to an access point to be under its control and on a frequency on which the access point has permission to transmit. This will prevent harmful interference from occurring."[28] The DSA believes that if the client devices are each receiving an enabling signal from an indoor access point, it is a reasonable assumption that each client is in proximity to an indoor access point, and if they are all operating on the same frequencies, the clients should be able to connect to one another directly while receiving the enabling signal.

VI. HIGHER POWER LIMITS AND ANTENNA DIRECTIVITY FOR STANDARD-POWER ACCESS POINTS

[27] See R&O at ¶ 201.

[28] Id.

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Throughout the course of this proceeding, the DSA has consistently supported flexible rules to permit fixed point-to-point technologies to facilitate broadband deployment, in particular to improve availability of connectivity and competition in underserved areas and rural communities that have been disparately affected by the Covid-19 crisis. Like the rest of the nation, these areas have struggled economically during the pandemic. But, these communities also have been forced to weather the crisis without the same levels of access to civic, educational, and telehealth resources that areas with robust broadband connectivity enjoy. This proceeding offers opportunities for the Commission to progress toward closing this gap.

Allowing standard-power access points in fixed point-to-point applications, such as backhaul, to operate at power levels greater than 36 dBm EIRP would have a meaningful effect on the digital divide.[29] Indeed, the Commission should not only permit directional antenna usage, the regulations should encourage this use where possible. Controlling the interference footprint of usage can significantly increase the capacity of the band for both directional and non-directional users. Permitting higher EIRP, without an increase in conducted power will significantly enhance the usability of this band, and not add to the overall levels of interference. The Commission's approach in the U-NII-3 5 GHz band has already been successful in this regard, and the Commission can build upon that success here. Specifically, the Commission should permit fixed point-to-point U-NII-5 and -7 standard power access points – whether

[29] *FNPRM* ¶ 252.

indoors or outdoors – to employ transmitting antennas with directional gain, including gain greater than 6 dBi, without any corresponding reduction in transmitter conducted power.[30]

AFC systems can easily incorporate and apply the beam patterns and orientation of standard power access point antennas when determining power levels and frequency availability in a geographic location, instead of assuming a worst-case omnidirectional antenna. To avoid harmful interference to other users, the Commission could require that professional installers be used to confirm the antenna installation parameters. In some cases, standard power access points with integrated antennas may be able to determine their own orientation and report that information automatically to the AFC. The Commission should allow the AFC to use antenna pattern and orientation information for any standard power access point for which the information can be reliably determined and communicated to the AFC, including for access points that do not exceed the 36 dBm EIRP limit and those used for purposes other than outdoor point-to-point communications. For example, there are numerous scenarios where indoor standard power APs may be necessary for particular applications such as indoor warehouses where directional antennas are necessary to light up long aisles that would not be permitted under LPI rules. Similarly, in buildings with especially high indoor attenuation typical of older stone buildings on university campuses or hospitals with abnormal numbers of interior walls it may be necessary to adopt a higher EIRP than otherwise permitted under LPI rules. Such deployments should be permitted to take advantage of the e-plane RLAN antenna pattern

[30] 47 C.F.R. § 15.407(a)(3)

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mismatch that the Commission confirmed in its analysis in the *Order*.[31] Otherwise, the efficiency of using 6 GHz spectrum will be significantly reduced, without providing any corresponding increased level of interference protection to incumbent systems.

To avoid delayed implementation of any AFC systems, support for directional antennas should not be required. An AFC operator can choose whether and when to support the use of directional antenna information. For example, the first iteration of an AFC could be deployed without such support, and after the feature is developed, could be added later. On the other hand, some AFC operators may be ready to support directional antennas in the first release of their AFC. To this end, we encourage the Commission to adopt an efficient, flexible, and dynamic certification program to encourage the continued evolution of AFCs. Such a framework would support both innovation and speed to market, as AFC operators will be able to offer new and improved services on an ongoing basis.

Respectfully submitted,

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[31] See R&O at ¶ 127.