

**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
)	

**REPLY COMMENTS OF
THE PUBLIC INTEREST ORGANIZATIONS**

**OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA
BENTON INSTITUTE FOR BROADBAND AND SOCIETY
AMERICAN LIBRARY ASSOCIATION
PUBLIC KNOWLEDGE
ACCESS HUMBOLDT
SCHOOLS, HEALTH & LIBRARIES BROADBAND (SHLB) COALITION**

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The Open Technology Institute at New America, the American Library Association, the Benton Institute for Broadband and Society, Public Knowledge, Access Humboldt, and the Schools Health & Libraries Broadband (SHLB) Coalition (“Public Interest Organizations” or “PIOs”) respectfully file these Reply Comments in response to the *Second Further Notice of Proposed Rulemaking* in the above-captioned proceeding.

I. Introduction and Summary

The Public Interest Organizations (PIOs) applaud the Commission for continuing to build on its world-leading innovation in unlicensed and shared spectrum policy. Thanks to the Commission’s visionary 6 GHz Order in 2020, all American consumers and businesses now have 1,200 megahertz of contiguous, open access spectrum that will enable not only next generation Wi-Fi technology, but also promote a variety of classes of devices that can spur innovation and

meet the widest possible range of connectivity needs. In these comments, the PIOs urge the Commission to extend Very Low Power (VLP) across the entire 6 GHz band, to approve client-to-client (C2C) inter-device communication indoors and, uniquely, to authorize a fourth class of unlicensed Geofenced Variable Power (GVP) devices that can operate both indoors and outdoors at a power level substantially higher than VLP is allowed without geolocation awareness and geofencing. Accordingly, the PIOs make the following key points:

First, the PIOs endorse the widespread support for the Commission's proposal to expand unlicensed use of very low power (VLP) devices to the U-NII-6 and U-NII-8 bands without geofencing and under the same technical rules as those for the U-NII-5 and U-NII-7. Extending VLP authorization across the entire 6 GHz band will benefit consumers and promote innovation in several ways. It will greatly benefit all consumers by allowing high-bandwidth VLP devices such as virtual reality goggles to operate with higher throughput and reduced latency. This opens up opportunities for more robust VLP operation in challenging but important high-data-traffic environments such as schools, libraries, airports, train stations, workplaces and other public and private venues. The addition of more contiguous wide channels both indoors and outdoors will itself promote further innovation in high-capacity wireless connectivity. Yet another key benefit is that VLP devices will be able to communicate directly and share data, in schools and other settings, through multiple contiguous 160 MHz and 320 MHz channels.

Moreover, the PIOs believe that technical studies in the record strongly support the conclusion that the VLP rules adopted in the *2nd Report & Order* can be safely extended to the U-NII-6 and U-NII-8 band segments with no significant risk of harmful interference to incumbent operations. We agree with commenters that studies in record clearly demonstrate this

low risk and, accordingly, we are not aware of concerns with extending VLP operations in the U-NII-5 and U-NII-7 bands to the U-NII-6 band.

Second, the PIOs generally support the Commission's proposal to authorize a new device class at power levels higher than the VLP device class approved in the *2nd Order* subject to exclusion zones that protect band incumbents. We agree there is a unique role for mobile devices that can operate at a higher power than VLPs within geofenced areas. However, we do not believe that the power level proposed in the FNPRM will create sufficient incentives for equipment makers—nor sufficient enhanced benefits for consumers—to spur the needed investment or justify the extra costs. The concept will be an innovative step ahead with a few changes. Specifically, the PIOs strongly support the proposal by Apple, Broadcom et al. to establish a geofenced variable power (“GVP”) device class with higher power levels up to 21 dBm EIRP and 8 dBm/MHz PSD. Further, we suggest that the Commission leverage the certified AFCs to determine the protection areas, but give device makers and operators flexibility to implement geofencing. Our groups also strongly opposes any consumer registration requirement for the use of GVP (or VLP) devices, which would pose unnecessary burden and risk to personal privacy.

Third, the record shows broad support and little opposition to authorizing indoor-only client-to-client (C2C) communications up to a limit of 24 dBm EIRP and -1 dBm/MHz PSD if all client devices are operating under control of the same AP. As OTI and Public Knowledge emphasized in previous comments on C2C devices, consumers routinely seek to communicate device to device, particularly indoors. C2C communications is particularly useful for a variety of applications in education, health care, industrial and mobile workforce applications that are essential for consumers and enterprise alike.

Finally, several incumbent licensees (e.g., AT&T, auto industry interests) seek to relitigate elements of the Commission’s 2020 *6 GHz Report and Order* and *2nd Report and Order*. These proposals should be summarily rejected. They lack merit and are extremely untimely when broadband providers, the public and the entire U.S. economy is in the midst of a massive deployment of next generation Wi-Fi infrastructure.

II. The Record Demonstrates Broad Support for Extending VLP Authorization to the U-NII-6 and U-NII-8 Bands

The PIOs strongly support the Commission’s proposal to “permit VLP devices to also operate in the U-NII-6 and U-NII-8 bands without geofencing.”¹ There is widespread support among commenters that the Commission should extend its authorization for unlicensed use of very low power (VLP) devices to include the 6425-6525 MHz (U-NII-6) and 6875-7125 MHz (U-NII-8) bands under the same technical rules as those for the U-NII-5 and U-NII-7. Giving consumers the benefit of access to the entire 6 GHz band without the added cost and complexity of geofencing or geolocation database coordination is supported by a chorus of stakeholders across multiple industry segments.² The increased capacity for VLP that is possible across a

¹ See *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Second Report & Order, Second Further Notice of Proposed Rulemaking, Memorandum Opinion and Order on Remand, FCC No. 23-86, ET Docket No. 18-295, GN Docket No. 17-183, at ¶ 173 (rel. Nov. 1, 2023) (“*2nd Report & Order*” or “*2nd FNPRM*”). Unless otherwise indicated, citations to Comments filed by parties are to this docket and filed on March 27, 2024.

² See, e.g., Comments of Consumer Technology Association (CTA); Comments of IEEE 802; Comments of Information Technology Industry Council (ITI); Comments of Japan Electronics and Information Technology Industries Association (JEITA); Comments of Wi-Fi Alliance (WFA); Comments of Dynamic Spectrum Alliance (DSA); Comments of Wireless Broadband Association; Comments of Ultra Wide Band Alliance (UWB); Comments of Apple, Broadcom, Microsoft, Google, Meta, Intel, Qualcomm (VLP Comments of Apple, Broadcom, et al.); Comments of Computer and Communications Industry Association (CCIA); Comments of Wireless Innovation Forum; Comments of Bluetooth Special Interest Group (Bluetooth SIG).

contiguous 1,200 megahertz will be particularly beneficial for schools, libraries, workplaces and heavily-trafficked public spaces.

Expanding VLP authorization to the U-NII-6 and U-NII-8 Bands will benefit consumers and promote innovation in several ways. First, it will greatly benefit all consumers, but especially users in a classroom, library, workplace or other environment with multiple simultaneous users by allowing high-bandwidth VLP devices such as virtual reality goggles to operate with higher throughput and reduced latency. As the Dynamic Spectrum Alliance (DSA) points out, “authorizing an additional two bands for VLP devices will increase the overall spectrum capacity available for VLP applications and allow for seven contiguous 160 MHz and three contiguous 320 MHz channels.”³ This opens up opportunities for more robust VLP operation in challenging but important environments with many simultaneous users of emerging and very high-bandwidth applications such as virtual and augmented reality. We agree with the Consumer Technology Association (CTA) and Information Technology Industry Council (ITI), for example, that this added capacity is “critical” for robust VLP operation in high-data-traffic environments such as schools, airports, train stations, workplaces and other public and private venues.⁴

Second, this added capacity and the addition of contiguous wide channels both indoors and outdoors will itself promote further innovation in high-capacity wireless connectivity. Wireless Broadband Alliance (WBA) points out that this expansion “will instantly permit up to three 320 MHz channels to enable multigigabit data transfer rates along with sub-10 milliseconds of latency for multiple simultaneous sessions in a scaled commercial deployment for augmented

³ Comments of DSA at 6.

⁴ Comments of CTA at 1; Comments of ITI at 1.

reality, virtual reality, and wireless casting in a host of industries including education, healthcare, and others in a cost-effective manner.”⁵ Workforce training would be one obvious beneficiary of the sort of innovation that could be unleashed with unshackled and low-cost unlicensed device connectivity.

A third key benefit is that VLP devices will be able to communicate directly and share data through multiple contiguous 160 MHz and 320 MHz channels. We agree that there should be no distinctions in the VLP rules between access points (“APs”) and clients because a given device may functionally serve both roles for the purposes of VLP communications. But as DSA points out, under current rules VLP devices restricted to the U-NII-5 and U-NII-7 bands will be limited to a small number of 80 MHz and 160 MHz channels, limiting their capability and potential innovation in the future.⁶ Japan Electronics and Information Technology Industries Association (JEITA) writes that this expansion would “allow OTA communication between an indoor/outdoor access point and a client device installed outside a car,” since it would increase the number of channels that can be used outdoors without an AFC system, and the transmission speed when multiple devices use the 6 GHz band at the same time.⁷

Interference

The PIOs believe the record now strongly supports the conclusion that the VLP rules adopted in the *2nd Report & Order* can be safely extended to the U-NII-6 and U-NII-8 band segments with no significant risk of harmful interference to incumbent operations. We agree with

⁵ Comments of WBA at 2.

⁶ Comments of DSA at 5.

⁷ Comments of JEITA at 1.

commenters that studies in the record clearly demonstrate this low risk and, accordingly, we are not aware of documented concerns with extending VLP operations to the U-NII-6/8 bands.

In their comments, ITI identifies two types of broadcast operations in U-NII-6/8: fixed central receive sites for electronic newsgathering (“ENG”) transmissions; and truck-mounted receivers for ENG transmissions from camera-back transmitters and other similar transmitters in the field. Concerning ENG central receive sites, Apple, Broadcom, et al, point to a September 2023 study that “applied the same techniques and assumptions as studies the Commission has previously relied on to assess the risk of interference to this class of receivers.”⁸ ITI correctly notes that this study simulated the same type of locations used by FS receivers and “found an even lower probability of interference from VLP devices operating at 14 dBm EIRP (-5 dBm/MHz) than the Commission found to be insignificant for LPI.”⁹

With respect to truck-mounted ENG receivers, a separate analysis by Broadcom demonstrates that “the only time harmful interference could even theoretically occur is when the ENG receiver operates without raising its antenna, a VLP device is used on the same channel within a few meters of the receiver, and the receiver communicates with an ENG transmitter a significant distance away.”¹⁰ We agree with ITI, Apple, Broadcom, et al. and other commenters that there is a very low probability that all of these events would happen at the same time. As ITI explains, “receivers on ENG trucks are generally mounted on a mast that can be raised up to 15

⁸ VLP Comments of Apple, Broadcom, et al., at 2-3, citing Letter from Paul Margie, Counsel to Apple, Broadcom., Google, and Meta Platforms, to Marlene H. Dortch, Sec’y, FCC, ET Docket No. 18-295, GN Docket No. 17-183 at 2–6 (filed Sept. 11, 2023) (“2023 VLP/ENG Study”).

⁹ Comments of ITI at 2.

¹⁰ “Analysis of Very Low Power RLAN Device Interactions with Electronic News Gathering Links in the 6 GHz Band,” attached to Letter from Christopher Szymanski and Thomas Derham, Principal Scientist, Broadcom Inc., to Marlene H. Dortch, Sec’y, FCC, ET Docket No. 18-295, GN Docket No. 17-183 (filed Sept. 11, 2023) (“2023 Broadcom ENG Study”).

meters. A given ENG transmission uses only a small portion of the GHz band, making an overlap in frequencies unlikely. If a VLP device is near an ENG truck it will also be near enough to the camera transmitter for the contention-based protocol to detect the signal and select an alternate channel. The operators of the ENG receiver will readily be able to identify any unauthorized person using a VLP device within a few meters of the truck.”¹¹

Referencing the 2023 Broadcom ENG Study, DSA observes that the risk of harmful interference is “significantly” minimized for such low-power and short range devices (Low Power Auxiliary Stations) operating in the U-NII-8 band, such as wireless microphones, cue and control communications, and TV synchronization signals. We agree with DSA that the combination of a VLP device’s contention-based protocol, low power, and low probability for co-channel operations in the same location significantly minimizes the risk of harmful interference.”¹²

For its part, the NAB describes ENG receivers as “hidden nodes” because ENG receivers are passive and therefore cannot be detected by unlicensed devices. As a remedy, NAB proposes to reserve 55 megahertz in the upper U-NII-8 band. However, an exclusive reservation of 55 megahertz for these occasional and sparse broadcast operations is as unjustified today as when it was first proposed.¹³ This argument is made as if the worst-of-the-worst hypothetical case is typical. NAB attempts to recycle its tiresome tactic of hypothesizing corner cases whenever shared spectrum access threatens to achieve more widespread and efficient use of one of its

¹¹ Comments of ITI at 2.

¹² Comments of DSA at 8.

¹³ Comments of National Association of Broadcasters at 3.

many underutilized bands for general public benefit. For instance, some of the claims it makes regarding how ENG links are deployed strain credibility (e.g., that ENG links have no margin).

OTI and Public Knowledge refuted similar claims by NAB in their 2022 opposition comments in response to the D.C. Circuit's very limited remand concerning the Commission's failure "to explain why its experience in the 2.4 GHz band supports its ability to protect licensed mobile operators from harmful interference."¹⁴ We noted that even if the NAB had actually substantiated its claims of interference from Wi-Fi in the 2.4 GHz band, the lower power and reduced propagation of LPI in the 6 GHz frequencies is a key characteristic of the band that reduces the risk of harmful interference.¹⁵ Although VLP can operate outdoors, it is also restricted to far lower power. And in the fairly rare circumstance that a wearable or other VLP device is activated very close to an ENG truck, any interference is likely to be fleeting and/or mitigated by body loss and clutter. In addition, with 1,200 megahertz available for VLP devices across the entire 6 GHz band, the sheer amount of bandwidth and the large number of channels makes interference far less likely. The fact that only a portion of VLP devices will utilize wide channels at all, or at any given time, further mitigates any risk.

More generally, the Commission should bear in mind the Policy Statement that it unanimously adopted barely more than a year ago, which stated that in light of the realities concerning the increasing need to share spectrum and that the "electromagnetic environment is highly variable, and zero risk of occasional service degradation or interruption cannot be guaranteed," both transmitters and receivers should be designed and operated to mitigate the risk

¹⁴ *AT&T Servs. v. FCC*, 21 F.4th 841, 854 (U.S. D.C. Cir. 2021).

¹⁵ Comments of Public Knowledge and the Open Technology Institute at New America, *Office of Engineering and Technology Seeks Comment Following Court Remand of 6 GHz Band Order*, ET Docket No. 18-295 GN Docket No. 17-183, at 6-7 (filed May 25, 2022).

of harmful interference.¹⁶ As the Public Interest Spectrum Coalition (PISC) reiterated in comments on the National Spectrum Strategy, the Commission and NTIA should take every opportunity to reinforce the policy that no spectrum user has a guarantee of zero interference, and that minimizing harmful interference and maximizing frequency sharing is a *mutual* obligation of band entrants and incumbents. The expectation must be limited to a regulatory effort to strike the best balance between private risks/costs and the overall public interest.¹⁷

Finally, Sirius XM writes that the Commission should continue to prohibit outdoor unlicensed use of the upper U-NII-8 band because of the risk that unlimited VLP device deployment would disrupt SDARS delivery to “tens of millions of subscribers and approximately 162 million radios.”¹⁸ Although Satellite Digital Audio Radio Service (SDARS) is not part of the Fixed Satellite Service (FSS), it does make use of fixed satellite ground stations to transmit digital audio signals up to the XM-Sirius constellation of geostationary satellites. XM-Sirius claims that the uplink for its fixed satellites operating in 7025-7075 MHz frequency range requires greater protection than that required by FSS stations but provides no detailed analysis to support its claims. XM-Sirius also doesn’t differentiate between the different theoretical sources of interference to its uplink operating in the frequency band, many of which are licensed incumbents.

¹⁶ Policy Statement, *Principles for Promoting Efficient Use of Spectrum and Opportunities for New Services*, 38 FCC Rcd 1152, at 2-3 (rel. April 21, 2023).

¹⁷ Comments of Public Knowledge; the Open Technology Institute at New America; Access Humboldt; the American Library Association; the Benton Institute for Broadband & Society; the Schools, Health & Libraries Broadband (SHLB) Coalition; United Church of Christ Media Justice Ministry; Next Century Cities; and X-Lab (collectively the Public Interest Spectrum Coalition, “PISC”), at 14, *In the Matter of Development of a National Spectrum Strategy*, No. 230308-0068 (April 17, 2023).

¹⁸ Comments of Sirius XM Radio Inc at i.

These concerns have already been addressed by the Commission. As the Commission writes in the *2nd Report and Order*, it already concluded in the *6 GHz Order* that FSS receivers in space would not receive harmful interference from either 6 GHz standard power or low-power indoor-only (LPI) devices.¹⁹ The risk of VLP causing harmful interference to FSS uplinks operating in the U-NII-5 and U-NII-7 bands is negligible. The Commission also already adopted a restriction to protect the satellite receivers by requiring that outdoor standard-power access points limit their maximum EIRP above a 30 degree elevation angle to 21 dBm, and since VLP devices are in any case limited to no more than 14 dBm EIRP, “for the same reasons, we conclude that no restrictions on VLP devices are necessary to protect FSS Earth-to-space operations,” the Commission said in the Second Order and Report.²⁰

III. A Separate Class of Geofenced Variable Power (GVP) Devices Should be Authorized to Operate at Substantially Higher Power Levels than VLP Devices

The PIOs generally support the Commission’s proposal to authorize a new device class that is authorized to operate at power levels higher than the VLP device class approved in the *2nd Order* subject to exclusion zones that protect band incumbents. We agree there is a unique role for mobile devices that can operate at a higher power than VLPs within geofenced areas. However, we do not believe that the power level proposed in the FNPRM will create sufficient incentives for equipment makers—nor sufficient enhanced benefits for consumers—to spur the needed investment or justify the extra costs. The concept will be an innovative step ahead with a few changes. Specifically, OTI strongly supports the proposal by Apple, Broadcom et al. to establish a geofenced variable power (“GVP”) device class with higher power levels up to 21

¹⁹ 2nd Report & Order at ¶ 45.

²⁰ 2nd Report & Order at ¶ 45.

dBm EIRP and 8 dBm/MHz PSD.²¹ Further, we suggest that the Commission leverage the certified AFCs to determine the protection areas, but give device makers and operators flexibility to implement geofencing.²² Our groups also strongly opposes any consumer registration requirement for the use of GVP (or VLP) devices, which would pose unnecessary burden and risk to personal privacy.

The PIOs believe the added cost and complexity that a geofencing requirement would impose on consumers would be worthwhile *only if* the Commission authorizes GVP devices to operate at power levels that would make a real difference in terms of both performance and innovation. Although the use of geofencing would allow the Commission to authorize a new class of GVP devices to operate at standard power (SP), Wi-Fi Alliance proposes,²³ our understanding is that authorizing a variable power up to 21 dBm EIRP and 8 dBm/MHz PSD would at least provide a sufficient incentive for an ecosystem of devices, applications and innovation to develop and flourish over time.

A new GVP device class at this higher power level would complement and fill a gap in the ecosystem. Currently the 6 GHz rules allow unlicensed use of LPI and VLP without the extra cost and complexity of geofencing or AFC control. Both of these device classes are authorized at hugely reduced power levels (compared to traditional Wi-Fi), but with LPI allowed somewhat higher power due to the attenuation of its indoor-only restriction. Outdoors, fixed devices can transmit at standard power if the operator is registered and has the authorization of an AFC that calculates channel and power availability based on granular geolocation information. What's

²¹ VLP Comments of Apple, Broadcom et al. at 3-4, 26-33.

²² *See, e.g., Id.* at 42-46.

²³ Comments of Wi-Fi Alliance at 13-14.

missing from the ecosystem—and what can spur even more consumer welfare and unlicensed innovation, in our view—is a GVP device class that can operate indoors and outdoors with enough power to make consumer devices (such as AR/VR glasses or goggles) more useful.

We agree with the many commenters who state that with sufficient incentive, geofencing is workable and could be incorporated by device makers or operators at a reasonable cost and without creating undue risk to consumer privacy. The Commission can and should leverage the extensive investments already made by certified AFC operators, which can use the same licensing data they already process and monitor to generate the polygons to define protection zones where GVP devices cannot operate (and/or must operate at a reduced power level).

Federated Wireless states that developing a geofencing system should be straightforward given that the Commission and industry already have at their disposal the AFC system, which was specifically designed to address and mitigate interference from unlicensed devices operating in the 6 GHz band. “The incumbent databases, Application Programming Interface (API), and interference protection calculations used today by AFC systems could be readily adapted to perform the geofencing functions proposed by the Commission.”²⁴

Moreover, the band’s AFCs are already in a position to support the most flexible and efficient use of GVP devices by calculating exclusion areas that vary based on power levels. Accordingly, we agree with Apple, Broadcom, et al. that “Commission rules should require that the size of an exclusion zone must increase in proportion to a GVP device’s power level.”²⁵ The implication, the companies assert, is that variable power—and, hence, variable exclusion

²⁴ Comments of Federated Wireless at 2.

²⁵ VLP Comments of Apple, Broadcom et al. at 29 (“Higher power levels would require larger exclusion zones, maintaining the same protection as a smaller exclusion zone for a device operating at lower power”).

zones—would accommodate an increase in the PSD limit to 8 dBm/MHz PSD without “any higher risk of harmful interference to incumbent licensees because of the limitations imposed by the proposed geofencing system.”²⁶

Geofencing unlicensed devices is workable and proven. One example of this is how the now decade-old TV White Space databases (TVDBs) have authorized unlicensed operations on available channels outside of exclusion zones calculated from the contours of licensed local TV broadcasters with few if any reported instances of interference. More recently, the TVWS rules have also authorized mobile TVWS operations within a geofenced area. Similarly, it is possible for an AFC—which is conceptually similar but more sophisticated than the TVDBs of years ago – to enable operations outside of geofenced protection zones that can be variable based on power level. The Commission should leverage the expertise and current investment in AFCs that are already in the process of final certification to coordinate use of the U-NII-5/7 bands at SP.

In addition, WinnForum, the multistakeholder group that has forged a consensus on operating parameters for both CBRS Spectrum Access Systems and 6 GHz AFC systems, states that it is ready to support the development of geofencing systems. WinnForum maintains it is able to develop specifications for the systems needed to calculate exclusion zones and for the specification of propagation models to address mobility in spectrum availability determinations.²⁷ Separately, the Bluetooth SIG states that while Bluetooth devices have no inherent means for determining geographic location, a high percentage of Bluetooth-enabled devices share space with Wi-Fi and/or cellular radios that can determine their location, and so in

²⁶ *Ibid.*

²⁷ Comments of WinnForum at 2-3.

those cases, coordination between the location aware device and the Bluetooth device can provide accurate geolocation and perform as a geofenced device.²⁸

While the record shows very little opposition to this approach to protecting incumbent operations from very low power devices, we do oppose AT&T's proposal for a "simplified" approach to geofencing that we believe would fail to leverage the capabilities of existing AFCs to make GVP device use as widespread or robust as it could be.²⁹ Crude, uniform and two-dimensional calculations of exclusion zones would be considerably less precise and larger than needed to protect incumbents. This would leave fallow enormous amounts of unassigned spectrum that could be used by GVP devices.

What AT&T describes is the approach the Commission took with TVWS more than a decade ago, when geolocation coordination was a new and "radical" idea, and when 3G phones were just being rolled out. Back then, the FCC's Office of Engineering and Technology was justifiably concerned that TVDBs were unproven and the on-device geolocation and computation power necessary to protect incumbents in real (or near real) time was insufficient. Today, the success of CBRS—where certified SASs have fully protected U.S. Navy radar without a single reported instance of harmful interference—and the capabilities of mobile devices suggest we should aim for intensive sharing. A geofencing approach *may* prove worth the extra cost to consumers – but not unless it is widely available and robust.

OTI does agree with several general points Comsearch raises concerning the implementation of geofencing, especially allowing device makers and operators flexibility to comply in different ways; modifying ULS and COALS to ensure they contain complete, up-to-

²⁸ Comments of Bluetooth SIG at 3.

²⁹ Comments of AT&T Services at 15.

date and accurate records; and the Commission being the entity where broadcaster's register ENG devices.³⁰ As DSA noted in its comments, coordination among geofence providers is “non-trivial.”³¹ However, they note that member companies are used to such issues from reservations made for wireless microphones in the TV White Spaces database and are prepared to handle coordination among AFC systems.

Having broadcasters register ENG use at the Commission would remove a key barrier for the operation of decentralized AFCs. We fully agree with the Dynamic Spectrum Alliance concerning the problems that a “database push” requirement would create.³² One big downside is battery drain, which is a serious concern considering the form factor for body worn devices. Of course, although this “push” approach was a poor fit for unlicensed access to TVWS years ago, it could be reasonable for the Commission to revisit the idea and see whether there has been any technological changes in the intervening years that would allow this to now be a viable approach.

Privacy

The PIOs strongly oppose any consumer registration requirement for the use of GVP (or VLP) devices. While devices will need to be certified and registered by type, and perhaps even by serial number, any registration requirement that applies to individual users is unduly burdensome, administratively unworkable, and a threat to personal privacy. This is particularly true because a large share of GVP devices will be wearables—including watches, glasses and goggles—that would allow an individual to be tracked. More concerning would be devices

³⁰ Comments of Comsearch at 3-4.

³¹ Comments of DSA at 16.

³² Comments of DSA at 16 (“Some DSA members recall the issues surrounding the timely protection of wireless microphone reservations in the TV White Spaces database, including the well-intentioned ‘database push,’ which would have drained the battery of portable devices because the device would always have to be listening to receive the localized notification that channel(s) needs to be vacated.”)

designed to (or able to) measure and track incredibly granular personal data, from heart rate to pulse oxygen to sleep patterns, and which are not restricted by any federal privacy legislation.³³

We therefore agree the Commission must be mindful of user privacy, especially in the face of a lack of regulation governing the data associated with these devices. There should be no burden on consumers to report their location. We agree with Federated Wireless that one good way to protect user privacy would be to require AFC systems (or any system implementing the protection areas) to delete any information collected about individual users of GVP devices, or the location or movement of devices, after a relatively short period of time.³⁴

IV. The Record Shows Broad Support for Authorizing LPI Client-to-Client Communications

The record shows broad support and little opposition to authorizing indoor-only client-to-client (C2C) communications up to a limit of 24 dBm EIRP and -1 dBm/MHz PSD if all client devices are operating under control of the same AP.³⁵ As OTI emphasized in previous comments on C2C devices, consumers routinely seek to communicate device to device, particularly indoors. C2C communications is particularly useful for a variety of applications in education, health care, industrial and mobile workforce applications that are essential for consumers and

³³ Christine Bannan and Andi Wilson Thompson, “Health and Fitness Wearables Leave a Lot of Our Data Unprotected. What Can We Do About It?” *Tech Policy Press* (Apr 28, 2021).

³⁴ Comments of Federated Wireless at 3. Federated Wireless proposes this in the context of their suggestion that the Commission and industry adapt AFC systems for the new VLP device class, rather than creating a whole new system to enable functions of geofencing.

³⁵ Second Further Notice at ¶¶ 187-194. *See, e.g.*, Comments of DSA at 9-11; Comments of Wi-Fi Alliance at 19-23; Joint Comment of Apple Inc., Broadcom Inc., Google LLC, Intel Corporation, Meta Platforms, Inc., Microsoft Corporation, Qualcomm Incorporated, at 1-2, 5-7 (“C2C Comments of Apple, Broadcom et. al”).

enterprise alike.³⁶ When client devices are sufficiently close to an access point, client-to client connectivity at the very low power levels allowed under the current rules for LPI client device communication (-1 dBm PSD) is extremely unlikely to cause harmful interference to incumbents, especially indoors, due to the close proximity between the client devices interconnecting for these sorts of applications.

In this proceeding, DSA highlights, as we have in the past, that classrooms and digital learning are among the very important use cases for C2C communications. “In a digital learning setting, be it a formal classroom or an informal space in a commercial, industrial, healthcare facility, etc., the instructor using a C2C topology can stream high-definition content directly to students’ devices, allowing for more immersive real-time interactions. ...The digital learning content can be deployed with low latency and without increasing the traffic loads on the facilities infrastructure.”³⁷ C2C communications, DSA writes, will also allow digital learning to occur in enclosed areas where there is no Wi-Fi infrastructure in place, and may therefore be an important tool for closing the digital divide and learning gap related to unequal access to internet service.

As Apple, Broadcom et. al point out, this power level is important to enable new classes of high-bandwidth applications, such as immersive and interactive extended reality (XR), to be accessed and used by multiple users across a large space at the same time. They note that when such applications are deployed at scale in coverage areas with many simultaneous users, such as a large classroom or open office environment, “the C2C communications need the full range of the maximum 24 dBm EIRP and -1 dBm/MHz PSD to overcome those losses and minimize

³⁶ Comments of OTI, *Office of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communications*, ET Docket No. 18-295, GN Docket No. 17-183, DA 21-7, at 2 (rel. Jan. 11, 2021).

³⁷ Comments of DSA at 10.

compromises.”³⁸ Otherwise, relying on devices subject to VLP power would limit the range to a few meters, limit the number of simultaneous sessions, and require all devices to be in the same room. “A regulatory power limitation of 24 dBm EIRP and -1 dBm/MHz PSD will provide reasonable range, coverage, and user experience that LPI users have come to count on.”³⁹ WBA similarly notes that the current limit on transmit power to 14 dBm for VLP mode “greatly restricts range and throughput of delay-sensitive advanced immersive applications such as Augmented and Virtual Reality.”⁴⁰

Several groups, including the Wi-Fi Alliance, also emphasize that permitting indoor-only client-to-client (C2C) communications at this level is consistent with international practices. “The Commission should require that the enabling signal be received at a strength of at least -82 dBm/20 MHz from an LPI access point or a signal strength corresponding to the equivalent range from a composite access point (LPI and standard power access point). This level is consistent with the latest technical studies and regulatory decisions in other countries.”⁴¹ Apple, Broadcom, et al. also propose -82 dBm/20 MHz (i.e., -95dBm/MHz) as the minimum enabling signal threshold for C2C, observing that this threshold has been adopted in the Technical Conditions for C2C in Japan and the EU.⁴² And DSA notes that the -82 dBm enabling signal

³⁸ C2C Comments of Apple, Broadcom et. al. at 7.

³⁹ *Ibid.*

⁴⁰ Comments of WBA at 4.

⁴¹ Comments of Wi-Fi Alliance at 22-23. *See also* Comments of DSA at 11-12; C2C Comments of Apple, Broadcom, et al. at 9-11; Comments of WBA at 4.

⁴² C2C Comments of Apple, Broadcom et. al at 9; *see* Draft ETSI EN 202 687 v0.0.18 6 GHz WAS/RLAN Harmonized Standard for Access to Radio Spectrum, Section 4.3.11 Client-to-Client Operations (2022-02) (requires ETSI account).

strength (in a 20 MHz channel) “is the IEEE 802.11 standard’s minimum receiver sensitivity for the lowest modulation coding scheme level.”⁴³

Our groups also support the Wi-Fi Alliance proposal to permit two client devices to communicate even if they receive enabling signals from two different indoor-only access points in order to realize the “full benefits of client-to-client connectivity, especially in enterprise settings where many of these communications will take place and where there are ubiquitous access points to which devices can connect.”⁴⁴ WBA notes that direct communications of LPI clients is already adopted by CEPT/ECC (ECC Decision (20)01), and argues that “global harmonization on C2C regulation is critical in enabling target use-cases and economy of scale for complying products.”⁴⁵

V. The Commission Should Summarily Reject Proposals by Incumbents to Reconsider the 2020 Order

Several commenters seek to relitigate elements of the Commission’s 2020 *6 GHz Report and Order* and *2nd Report and Order*. These proposals should be summarily rejected. They lack merit and are extremely untimely when broadband providers, the public and the entire U.S. economy is in the midst of a massive deployment of next generation Wi-Fi infrastructure.

For instance, auto industry associations recycle their request that the Commission adopt a -37 dBm/MHz out-of-band emissions (OOBE) level for 6 GHz VLP devices, which is a level 10 dB lower than the -27 dBm/MHz level the FCC adopted in the 6 GHz Report and Order four years ago.⁴⁶ In another re-run, the NAB once again presses its rejected effort to redefine the

⁴³ Comments of DSA at 11.

⁴⁴ Comments of Wi-Fi Alliance at 23.

⁴⁵ Comments of WBA at 4.

⁴⁶ Comments of 5GAA, Alliance for Automotive Innovation, AASHTO, ITE, and ITS America at 1.

measure of harmful interference to be “signals exceeding -6 dB above the receiver noise floor.”⁴⁷

There is also a renewed effort among commenters to insist that aggregate interference for terrestrial links exists, discrediting the use of the Monte Carlo analysis.⁴⁸ These continued complaints by band incumbents all seek to relitigate issues settled in 2020 or by the D.C. Circuit’s decision upholding the Commission’s Order and rationale. They are effectively untimely petitions for reconsideration which will hobble the availability and quality of next generation Wi-Fi so critical to consumers and to narrowing the digital divide.

Efforts from some commenters to use the 2nd *FNPRM* as yet another opportunity to propose new, further constraints on previously authorized unlicensed operations in the band are especially counterproductive. For instance, AT&T suggests requiring all 6 GHz unlicensed devices have uploadable firmware to change frequencies.⁴⁹ The NPSTC argues for creating a mechanism to log complaints of harmful interference to incumbents from all categories of unlicensed devices.⁵⁰ The Commission should ignore these entreaties. As CCIA points out, the D.C Circuit found that the Commission’s assessment and treatment of potential interference is perfectly consistent with existing Commission regulations.⁵¹

⁴⁷ Comments of NAB at 8-10.

⁴⁸ Comments of AT&T at 11; Comments of Electric Power Research Institute, Inc., at 3; Comments of American Petroleum Institute at 2-4.

⁴⁹ Comments of AT&T at 6.

⁵⁰ Comments of NPSTC

⁵¹ Comments of CCIA at 2; *AT&T Servs., Inc. v. FCC*, 21 F.4th 841 (D.C. Cir. 2021)

VI. Conclusion

The PIOs applaud the Commission for its continued efforts to put unused spectrum to use and to expand its use cases for applications in so many different fields, from education to healthcare. The PIOs urge the Commission to complete its work on the proposals that remain pending from both the first and second FNRPMs. The record shows broad and consistent support from both industry and consumer groups for extending the use of the current VLP authorization to the U-NII-6 and U-NII-8 bands, for the establishment of a new class of Geofenced Variable Power devices at a substantially higher power level, and for approving indoor use of C2C communications which are critical to ordinary consumers and for closing the digital divide.

Respectfully submitted,

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