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

In the Matter of	)	
	)	
The Office of Engineering & Technology	)	ET Docket No. 18-295
Seeks Additional Information Regarding	)	
Client-to-client Device Communications	)	GN Docket No. 17-183
in the 6 GHz Band	)	

REPLY COMMENTS OF THE DYNAMIC SPECTRUM ALLIANCE

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March 23, 2021

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I. INTRODUCTION AND SUMMARY

The Dynamic Spectrum Alliance[1] respectfully submits the following Reply Comments to the Federal Communications Commission (FCC) Office of Engineering Technology's (OET) Public Notice (PN) on client-to-client (C2C) communications.[2]

The record demonstrates that low power indoor (LPI) C2C communications support important unlicensed use cases that will further increase the utility of the 6 GHz band. The DSA believes that with a limited set of common-sense technical rules, LPI client devices engaging in C2C communications can share spectrum with incumbents without materially increasing the risk of harmful interference above that of LPI clients that associate with indoor access points. DSA and other advocates for indoor C2C communications have been unequivocal in stating that they do not support the daisy-chaining of LPI client devices.

The common-sense technical rules the Commission should adopt include: 1) permitting LPI client devices engaged in LPI C2C communications to operate with the same power spectral density limit as LPI client devices engaged in LPI client to indoor access point communications; 2) permitting direct LPI C2C communications between any two LPI client devices that can each

[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 the DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members/.

[2] Public Notice, The Office of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communication in the 6 GHz Band, ET Docket No. 18-295, GN Docket No. 17-183, DA 21-7 (released January 11, 2021) (PN).

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decode an enabling signal transmitted by a LPI access periodically; 3) permitting LPI client devices to receive the enabling signal from any LPI access point; and 4) permitting LPI C2C communications on any available channel. Commenters supporting C2C communications agree that, so long as an LPI client can decode an enabling signal transmitted periodically from an LPI access point, the LPI client device will remain within the coverage area of the LPI access point.

The OET clearly explained that its intent for the PN was to "examine whether a more limited approach to indoor client-to-client communications within the ambit of the 6 GHz Notice should be permissible."[3] As such, the Commission should dismiss unsupported claims that the PN is a Petition for Reconsideration to permit LPI mobile hot spots by another name. It is not.

It should come as no surprise to the Commission that virtually all commenters opposing LPI C2C communications also are opposed to the Commission's LPI regulations.[4] Many of the arguments put forward are simply reworded versions of those the Commission had dismissed previously regarding LPI operations in the 6 GHz band. Some of these arguments can be found in the Petitions for Reconsideration[5] filed to the 6 GHz Report and Order[6] and in the appeal of

[3] *See* Public Notice at 2.

[4] *See* Comments of the Automotive Innovation ("AAI") at 6-7; *See* Comments of the American Association of Railroads ("AAR") at 2; *See* Comments of AT&T at 3; *See* Comments of the Fixed Wireless Communications Coalition ("FWCC") at 5; *See* Comments of the National Association of Broadcasters ("NAB") at 3; *See* Comments of Southern Company ("Southern") Comments at 5-7; and *See* Comments of the Utilities Technology Council et al. ("Incumbent Stakeholders") at 5.

[5] *See* Petition for Reconsideration of Fixed Wireless Communications Coalition, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 25, 2020)*; See* Petition for Reconsideration of APCO International, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 25, 2020).

[6] *Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020) (6 GHz Order and 6 GHz Further Notice, respectively).

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the 6 GHz regulations filed at the D.C. Circuit.[7] Rather than addressing the matter at hand, most of these commenters choose to raise extraneous issues such as the status of the Multi Stakeholder Group (MSG), the FCC reporting requirement tucked into the 5,593-page $2.3 trillion *Consolidated Appropriations Act, 2021*, or new demands regarding testing after FCC certification that would undermine the FCC's equipment certification process and have far reaching consequences beyond the 6 GHz proceeding.

These commenters choose to ignore: 1) that there is an extensive technical record supporting the Commission's decision in the 6 GHz Report and Order; 2) that indoor client-to-client communication in the 6 GHz band is technical feasible and can be permitted in a manner that does not increase the risk of harmful interference to incumbent operations; and 3) that the sole purpose of the enabling signal is to ensure that the client device is operating sufficiently close to an indoor access point.

In addition to putting forward recycled arguments, the commenters opposed to LPI C2C communications make factual errors, answer questions that were not asked, and create improbable scenarios that do not hold up to scrutiny. Finally, some of the "mitigations" proposed fall under the category of poison pills. For example, if the Commission were to apply its "indoor requirements" for LPI access points to LPI client devices seeking to engage in indoor C2C communications, battery operated client devices would be prohibited. This would most likely

[7] *See* Initial Joint Brief of Petitioners, UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT, AT&T SERVICES, INC. (Petitioner) v. FEDERAL COMMUNICATIONS COMMISSION; UNITED STATES OF AMERICA (Respondents)., United States Court of Appeals Case #20-1190, Document #1876364 (filed December 18, 2020).

eliminate the entire portable client device category. The Commission should not be fooled by these arguments, which at their core seek to re-litigate the 6 GHz Report and Order.

II. LOW POWER INDOOR CLIENT-TO-CLIENT COMMUNICATIONS IMPROVE PERFORMANCE OF CURRENT USE CASES AND ENABLES NEW USE CASES

According to the Wi-Fi Alliance "…as Wi-Fi Alliance and its members have demonstrated, indoor client-to-client transmissions are an important and growing segment of the Wi-Fi ecosystem."[8] Currently, Wi-Fi client devices engage in C2C communications using the 2.4 GHz and 5 GHz bands. New America / OTI concur, noting that today, "Consumers routinely seek to communicate device to device, particularly indoors. One or both devices may be connected to a Wi-Fi router, but in either situation it is most efficient and often even necessary for one low-power device to communicate directly to the other" and identifying a series of current C2C uses.[9]

In its comments, the WBA also identifies current use cases (e.g., large file transfer such as a video file, a set of images, or other similar data between two smart phones or a smart phone and a laptop computer) and makes the case that, by permitting C2C indoor communications in the 6 GHz band, it will both improve the user experience and reduce the airtime required, which will also benefit other users of the indoor access point.[10]

[8] *See* Comments of the Wi-Fi Alliance at 2.

[9] *See* Comments of New America Foundation / Open Technology Institute ("New America / OTI") at 2-3.

[10] *See* Comments of Wireless Broadband Alliance (WBA) at 2-3.

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WBA extends its argument to high-bandwidth low latency new use cases such as augmented, virtual, or mixed reality ("AR/VR/MX"), "…where real-time data from different components of the AR/VR/MX system experience channel contention, low data transfer rate, and/or unnecessarily long latency –all resulting in poor user experience."[11] New America / OTI agree, asserting that with respect to the 6 GHz band, "Client-to-client device connections will be a practical necessity to realize the benefits of many innovative, high-capacity and low-latency use cases for LPI in particular."[12]

The C2C Advocates generalize these arguments, noting that "C2C communications would offer important additional flexibility for network topologies and low latency applications."[13] The C2C Advocates further identify circumstances where "C2C communications also will allow interactions between clients in situations, topologies, and use cases where it is impractical or unnecessary to gain access to an infrastructure-based network."[14] They argue that "C2C will produce substantial user and network-management benefits by supplementing LPI and other AP-mediated communication in public environments such as airport terminals, healthcare facilities, large individual school or office buildings, conference centers, and government buildings. These locations will be equipped with LPI APs and densely populated both by visitors carrying one or

[11] *Id.*

[12] *See* Comments of New America / OTI at 2-3.

[13] *See* Comments of Apple, Inc., Broadcom Inc., CommScope Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Microsoft Corporation, and Qualcomm, Inc. (C2C Advocates) at 3.

[14] *Id.*

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more portable 6 GHz devices, and by employees with authorization to associate with some but not all local APs."[15] For a number of these new use cases that will be enabled by 6 GHz indoor C2C communications, it is in fact the low latency that makes the mode of communication commercially useful. This is the reason the DSA believes that the AAR is completely missing the point when it asserts that "…there is little benefit to client-to-client operations other than saving a few seconds of latency."[16]

In the near term, DSA foresees consumer use cases for C2C communications in the form of LPI clients that receive an enabling signal from an LPI access point in the U-NII-5, U-NII-6, U-NII-7, and U-NII-8 bands. Once Automated Frequency Coordination (AFC) systems are certified and (indoor and outdoor) standard power access points are deployed in the near future, enterprises and public areas with managed standard power 6 GHz Wi-Fi networks should be permitted to utilize the higher-powered client communications available in the U-NII-5 and U-NII-7 bands. The decoded enabling signal would have to include information on whether the enabling signal is coming from a LPI access point or a standard power access point. In this way, two clients can communicate directly on a channel in the U-NII-5 and U-NII-7 band at an EIRP limit that is no less than that for LPI client devices operating in the U-NII-5 and U-NII-7 band and could operate at a higher EIRP level on a channel, if the AFC indicates the channel is

[15] *Id* at 5.

[16] *See* AAR Comments at 4-5.

available and at a high EIRP level. The DSA recognizes that this "mixed mode" client regime will be a little more complicated.

III. THE PUBLIC NOTICE SUPPLEMENTS THE RECORD

The DSA understands and agrees with the reasoning behind the Commission prohibiting LPI client devices from acting as "mobile hot spots."[17] If a LPI client device is permitted to operate as a mobile hot spot, it would be able to initiate a network with other client devices without regard to their location with respect to an indoor access point. As the PN states, the Commission did not examine whether a more limited approach to indoor C2C communications was possible.[18] Comments filed in response to the 6 GHz Further Notice, including those from DSA, identified the public interest for the Commission to permit more limited indoor C2C operation.[19] Other parties provided a technical proposal for ensuring indoor C2C communications would not cause harmful interference to incumbent operations.[20] The

[17] *See* 6 GHz Report and Order, 35 FCC Rcd at 3927, para. 202.; 47 CFR § 15.407(d)(5).

[18] *See* Public Notice at 2.

[19] *See* Comments of DSA to the 6 GHz Further Notice, ET Docket No. 18-295, GN Docket No. 17-183 at 19-20 (filed June 29, 2020).

[20] *See* e.g., Letter from Paul Caritj, Counsel for Apple Inc., Broadcom Inc., Facebook, Inc., Google LLC, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183, at 1-2 & attach. slides 9-10 (filed Nov. 6, 2020); Reply Comments of Broadcom Inc. and Microsoft Corporation at 2-4, ET Docket No. 18-295, GN Docket No. 17-183 (filed July 29, 2020); Comments of Apple Inc., Broadcom Inc., Google LLC, and Microsoft Corporation at 11-14, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 29, 2020).

Commission responded to this new information appropriately by asking questions about this more limited approach in the PN.

Even so, there are several commenters that attempt to mischaracterize OET seeking more information on this more limited approach as being tantamount to a Petition for Reconsideration to the 6 GHz Report and Order filed after the deadline.[21] The record shows this is, in fact, not the case. The PN does not seek information on how client devices could operate as mobile hotspots or initiate a network. On the other hand, if the PN sought comments on authorizing indoor client devices to have the same EIRP and PSD limits as indoor access points, as permitted in other countries, that would qualify as a Petition for Reconsideration, as there were several comments submitted to the 6 GHz Notice[22] in favor of such action. In sum, the PN is unmistakably not an attempt at a Petition for Reconsideration.

IV. INDOOR CLIENT-TO-CLIENT COMMUNICATION WILL ONLY IMPROVE COEXISTENCE

Indoor C2C communications are intended for the larger 6 GHz channel sizes that are ideal for high bandwidth low latency use cases. To take advantage of the higher order modulation and coding schemes required for these types of use cases, the separation distance between client devices is likely to be relatively close – closer than the enabling indoor access point's radius of

[21] *See* AAR Comments of 10-11, *See* AT&T Comments at 2; *See* Comments of Incumbent Stakeholders at 1-2.

[22] *Unlicensed Use of the 6 GHz Band*, Notice of Proposed Rulemaking, 33 FCC Rcd 10496 (2018) (6 GHz Notice).

coverage. Theoretically, while clients could communication at the edge of their respective ranges, the throughput would be so limited because of the PSD limit, path loss and other losses, that the client device would most likely communicate over a different Wi-Fi band for indoor C2C communications, or simply connect through an indoor access point.[23] Intuitively, with larger channel sizes available in the 6 GHz band, and faster data rates expected, indoor C2C communications will lead to less airtime to complete transmissions. It should be equally as intuitive that C2C communications will reduce the total number of transmissions because each client does not have to communicate with an indoor access point first.

Commenters supporting indoor C2C communications agree with DSA that indoor direct C2C communications will reduce the overall number of transmissions and increase spectral and energy efficiency when compared to the current status where no indoor C2C communications are permitted, and every indoor client-to-client communication has to travel first through its respective access point.[24]

Several commenters opposed to indoor C2C communications assert without support just the opposite - that indoor direct C2C communications will increase the number of transmissions, increase the duty cycle, and overall degrade the interference environment.[25] These hypotheticals do not reflect how Wi-Fi clients operate and amount to nothing more than arm waving.

[23] Most Wi-Fi devices are anticipated to be "tri-band" and include radios in the 2.4 GHz, 5 GHz, and 6 GHz bands.

[24] *See* C2C Advocates Comments at 3,7; See WBA Comments at 2.

[25] *See* Comment of FWCC at 3; *See* Comments of AAR at 2, See Comments of Incumbent Stakeholders at 7,10.

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V. THE INDOOR ACCESS POINT ENABLING SIGNAL HAS ONE PURPOSE AND ONE PURPOSE ONLY

The sole purpose of the enabling signal is to ensure that client devices engaged in indoor C2C communications are and remain with the coverage area of an indoor access point during the communication. Advocates for indoor C2C communications uniformly recognize this. They also understand that fulfilling this sole purpose is the reason the proposed threshold necessary for decoding the C2C enabling signal should be different than the threshold for signals used for other purposes, such as a clear channel assessment and energy detect.

VI. SOME ARGUMENTS AGAINST INDOOR C2C COMMUNICATIONS REHASH PREVIOUSLY DISMISSED ARGUMENTS OR CREATE IMPROBABLE SCENARIOS

Arguments that fall into this category include the assertion AAR made about the potential that indoor C2C communications will lead to aggregate interference to incumbent operators.[26] With respect to fixed links, the Commission confirmed in the 6 GHz Report and Order that its concern was over a single-entry (LPI) interferer rather than aggregate interference. [27] By raising

[26] *See* AAR Comments at 6.

[27] *See* 6 GHz Report and Order at ¶72. "The Commission did not propose, nor do we find that there is any need, to consider the effect of aggregate interference from multiple access points to point-to-point microwave links, as suggested by AT&T, CTIA, and Comsearch. As the Fixed Wireless Communications Coalition notes, the risk of interference from large numbers of standard power access points would not be due to signal aggregation from multiple unlicensed devices, but from a single standard-power access point in or near the main beam of a microwave link receive antenna with little or no intervening clutter."

the issues of aggregate interference with respect to indoor C2C communications, AAS seeks to re-litigate the Commission's rules.

The NAB raises concerns about the potential impacts of indoor C2C communications operating in the U-NII-6 and U-NII-8 bands on indoor and outdoor electronic newsgathering operations.[28] These client devices will continue to have the same contention-based protocol required of LPI access points and client devices that the Commission has already authorized to operate in the 6 GHz band. Further, as was discussed in the 6 GHz record, broadcasters do have the option of using similar wireless equipment that transmits over cellular frequencies for the same purpose. NAB also raises the issue of C2C communications being tantamount to a mobile hot spot, [29] which runs counter to the Commission's position that an indoor client directly communicating with another indoor client is much more limited in functionality than a mobile hot spot. Indoor C2C communications within the coverage area of the enabling access points should not materially increase the risk of harmful interference to incumbent operations in the U-NII-6 and U-NII-8 bands within an indoor venue. Towards the end of its filing, NAB proposes that the Commission address its concerns regarding indoor C2C communications by setting aside a portion of the U-NII-8 band everywhere for ENG - an activity with very low spectrum utilization. One might view this as NAB asking the Commission to reconsider its 6 GHz rules.

[28] *See* NAB Comments at 5-6.

[29] *Id*. at 2.

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Examples of highly improbable scenarios can be found in the comments of Southern and those of AT&T. Southern argues that the -99 dBm/MHz enabling signal could come from a fixed link.[30] The DSA believes this scenario is highly unlikely as the LPI client does not only detect the enabling signal of the indoor access point, the LPI client also has to decode it. It is a stretch to suggest that the LPI client will mistake energy received from a fixed link or any other sources as a decoded signal.

AT&T puts forward a scenario that would essentially require the directly communicating LPI access points be located in adjacent homes, each with the indoor LPI access point located in the garage with the door open and the client devices be located in convertibles with the top down and the engine left running on each driveway.[31] For this to situation to occur, there could not be any outdoor clutter, the clients would have to be communicating on the same channel as the fixed link, and at least one of the client's antenna would have to be transmitting in a direction in or near the boresight of the fixed link. Furthermore, this activity would have to occur very late at night during a period of a deep fade for a fixed link with a very low fade margin. The DSA believes it is highly improbable for a such a scenario to occur naturally.

Finally, the Alliance for Automotive Innovation (AAI) argues that the Commission should not allow indoor C2C communications in the lowermost U-NII-5 channels because indoor client devices will operate beyond the indoor access point signal and the adjacent channel emissions

[30] *See* Southern Comments at 3.

[31] *See* AT&T Comments at 6.

will likely cause harmful interference to CV2X users."[32] Previously, AAI asked the Commission to prevent VLP signals in the lowermost U-NII-5 channels because of what it claims as the potential of outdoor VLP devices to cause harmful interference to CV2X operations in the adjacent band. The proposal for indoor C2C communications would not extend the range of LPI APs outdoors. Consequently, there is no need for the Commission to implement such a prohibition.

VII. PROPOSED MITIGATIONS ARE DESIGNED TO BE POISON PILLS TO INDOOR C2C COMMUNICATIONS

Several commenters opposing indoor C2C communications propose "mitigations" that, if adopted, would serve as "poison pills" and undermine the commercial case to indoor C2C communications. These include the Commission applying the LPI access point "indoor only" criteria to LPI client devices that would prohibit battery operated client devices[33] and LPI client devices having to decode a very frequent enabling signal that would prematurely drain battery life.[34] Instead, the Commission need only consider are the detection threshold of the enabling signal and how frequent the enabling signal needs to be transmitted.

[32] *See* AAI Comments at 3.

[33] *See* AT&T Comments at 8.

[34] *See* AT&T Comments at 6; FWCC Comments at 5.

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VIII. CONCLUSION

The DSA believes the Commission has all the information it requires to permit indoor client-to-client communications in a manner that will improve user experience for existing C2C use cases, facilitate exciting new use cases where high throughput and low latency are required, while not materially increase the risk of harmful interference to incumbent operations.

Respectfully submitted,

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