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
	)	

REPLY COMMENTS OF THE UTILITIES TECHNOLOGY COUNCIL, THE EDISON ELECTRIC INSTITUTE, THE AMERICAN PUBLIC POWER ASSOCIATION, THE NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION, THE AMERICAN GAS ASSOCIATION, THE AMERICAN PETROLEUM INSTITUTE, THE AMERICAN WATER WORKS ASSOCIATION, APCO INTERNATIONAL, INTERNATIONAL ASSOCIATION OF FIRE CHIEFS AND THE NATIONAL PUBLIC SAFETY TELECOMMUNICATIONS COUNCIL

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SUMMARY

The comments on the record overwhelmingly oppose allowing client-to-client communications, and the proponents have failed to provide sufficient technical information to show that such operations would not cause harmful interference to licensed microwave systems – many of which are used to support mission-critical communications for public safety and electric, gas and water utilities and other critical infrastructure industries. The Commission was correct to prohibit client-to-client communications in its *Report and Order*, and rigorous real-world interference testing and additional actual experience with unlicensed operations in the 6 GHz band is necessary before any expanded unlicensed uses – including client-to-client communications – is permitted.

Comments on the record explain that client-to-client communications would increase the interference potential to licensed microwave systems by allowing such operations based on a weak enabling signal coupled with a lengthy signal detection interval that together would have the practical effect of increasing the coverage and the effective isotropic radiated power (EIRP) of unlicensed low-power indoor (LPI) and standard-power access devices, which in turn could result in outdoor operations and other reasonably foreseeable uses that would cause harmful interference to licensed microwave systems in the 6 GHz band. Client-to-client communications would also lead to an increase in the transmissions between client devices, which would increase the duty cycle as well as other technical parameters that would further increase the interference potential of these operations.

Despite these interference issues, proponents have failed to provide technical information to support their claims that client-to-client communications will not cause harmful interference. Worse, they oppose safeguards that would help to mitigate the potential for interference, such as

requiring clients to use an enabling signal from the same access point and the same channel and other related safeguards, including requiring two-way communications validation between client devices and the access point to ensure proximity with the access point as well as to prevent spoofing of the enabling signal. As such, the Commission should not permit client-to-client communications, or alternatively it should only permit such operations subject to conditions that would require client devices to receive their enabling signal from the same access point on the same channel, as well as other technical limitations to safeguard against interference to licensed microwave systems in the 6 GHz band.

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The Utilities Technology Council (UTC), the Edison Electric Institute (EEI), the American Public Power Association (APPA), the National Rural Electric Cooperative Association (NRECA), the American Petroleum Institute (API), the American Gas Association (AGA), the American Water Works Association (AWWA), APCO International (APCO), the International Association of Fire Chiefs (IAFC) and the National Public Safety Telecommunications Council (NPSTC)(collectively, "6 GHz Incumbent Stakeholders") hereby file the following reply comments in response to the Office of Engineering and Technology's (OET) Public Notice in the above-referenced proceeding.[1] The record reflects overwhelming opposition to allowing client-to-client (C2C) communications because any such expanded unlicensed operations is premature and proponents impermissibly seek reconsideration of the Commission's *Report and Order*, which already prohibited such operations.[2] Although the record lacks any meaningful technical support that would demonstrate that C2C

[1] *The Office of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communications in the 6 GHz Band*, Public Notice, ET Docket No. 18-295, DA 21-7, 86 Fed. Reg. 6644 (rel. Jan. 11, 2021), *available at* https://docs.fcc.gov/public/attachments/DA-21-7A1.pdf. (hereinafter "Public Notice").

[2] The 6 GHz Incumbent Stakeholders support the Fixed Wireless Communications Coalition (FWCC), which opposes allowing client-to-client communications, based on both substantive and procedural grounds. *See* Letter from Donald Evans and Seth Williams, Counsel for the Fixed Wireless Communications Coalition to Marlene H. Dortch, Secretary, Federal Communications Commission in ET Docket No. 18-295 (filed Dec. 3, 2020), *available at* https://ecfsapi.fcc.gov/file/1203114519697/fl.2020.12.02%2018-295%20ExP%206%20GHz%20(01487763xB3D1E).pdf. As the FWCC has explained, the relief requested by Broadcom, Intel and Microsoft in their October 22, 2020 *ex parte* letter is "procedurally deficient and substantively without support." Moreover, "instead of seeking reconsideration of the 6 GHz Order as required by Commission rules, the authors of the October 22 Letter now seek to collaterally attack the 6 GHz Order's conclusion regarding client-to-client communications." *See also Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020) ("*Report and Order*"). *See also* Letter from Christopher Szymanski, Broadcom Inc., et. al., to Marlene H. Dortch, Secretary, Federal Communication Commission, ET

communications will not cause interference to licensed operations, proponents nonetheless oppose any safeguards that might limit the interference potential of C2C communications. Accordingly, the 6 GHz Incumbent Stakeholders agree with the overwhelming number of comments on the record that oppose allowing C2C communications, which would demonstrably increase the interference potential to licensed microwave systems and which lack sufficient safeguards to mitigate the potential for interference to licensed microwave systems.

I. The FCC Should Not Allow C2C Communications in the 6 GHz Band Because It Would Increase the Interference Potential to Licensed Microwave Systems.

The Commission should not permit C2C communications in the 6 GHz band because such unlicensed operations would significantly increase the interference potential to licensed microwave systems. As these comments explain and as further described below, C2C communications would significantly enlarge the coverage area and increase the EIRP of unlicensed LPI and standard-power access systems. In addition, C2C communications would increase the duty factor and otherwise exacerbate interference to licensed microwave systems. Accordingly, these comments agree that it would be premature to permit C2C communications at this time, and they should not be permitted until rigorous real-world interference testing has been conducted and shows that C2C communications and other unlicensed operations in the band will not cause harmful interference to licensed microwave systems.

A. C2C communications would significantly enlarge the coverage and the EIRP of unlicensed LPI and standard-power access systems.

The inherent purpose of C2C communications is to increase the effective range of client devices to support broadband transmissions and C2C communications would dramatically increase the coverage and the EIRP of unlicensed LPI and standard-power access devices. As Southern explained

Docket No. 18-295, GN Docket No. 17-183 (Oct. 22, 2020) (October 22 Letter), *available at* https://ecfsapi.fcc.gov/file/1022320205247/Ex%20Parte_Enabling%20Portable%20Operations_22Oct2020%20(with%20attachment).pdf.

in its comments, "[n]ot only would client-to-client operations significantly increase the potential for client devices to operate outdoors or in areas with little to no building entry loss, the current rules would allow them to do so at a substantially higher power level than what the Commission has been considering for unlicensed very low power ("VLP") operations."[3]

The fundamental problem is with the "weak received signal level" of -99 dBm/MHz that proponents have suggested for the enabling signal to use to permit C2C communications, which is much weaker than the minimum signal strengths typically required for communications with an access point for broadband applications.[4] The record is replete with comments that oppose using such a low minimum signal strength. As Nokia observes, this would allow a client device to "operate 4 dB beyond a Wi-Fi access point coverage based on the minimum required sensitivity of -82 dBm/20 MHz specified in IEEE standards set forth in P802.11ax Table 27-51."[5] Moreover, NAB observes that the -99 dBM/MHz detection threshold for C2C would be 250 times higher compared to the detection threshold for contention-based protocols (i.e. -62 dBm/20 MHz), meaning as a practical matter that licensed operations would receive less protection against interference than unlicensed operations.[6] NAB estimates that "[u]nder the RLAN proponent's proposal, an LPI access point transmitting indoors at 5 dBm/MHz would be detectable by a client device at a distance of about 580 meters (over 2,800 feet) indoors, and at about 55 meters (about 180 feet) outdoors (accounting for building loss) if the client device is located outdoors."[7]

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[3] Comments of Southern Company Services, Inc. in ET Docket No. 18-295 at 4-5 (filed Feb. 22, 2021).
[4] *Id.* at 3, *citing* Public Notice at 3.
[5] Comments of Nokia in ET Docket No. 18-295 at 2 (filed Feb. 22, 2021). *See also* Comments of AT&T in ET Docket No. 18-295 at 5 (filed Feb. 22, 2021)(stating "[t]his figure [-82 dBm/MHz] is the same threshold used for clear channel assessment in Wi-Fi systems, and it represents a power level that is more appropriate to reflect a client device's ability to associate with—and exchange data with—the AP.") *And see* Comments of the Fixed Wireless Communications Coalition (FWCC) in ET Docket No. 18-295 at 4 (filed Feb. 22, 2021)(stating "The enabling signal should be received by the client device at a level consistent with that needed to exchange data with the AP at the rate the client intends to use. The enabling signal proposed by RLAN proponents is not sufficient to serve that purpose. At a minimum, client devices should detect the enabling signal at -95 dBm/MHz (-82 dBm/ 20 MHz).")
[6] Comments of National Association of Broadcasters (NAB) in ET Docket No. 18-295 at 5 (filed Feb. 22, 2021).
[7] *Id.*

B. C2C communications would increase the duty factor and otherwise exacerbate interference to licensed microwave systems.

In addition to increasing EIRP and coverage, C2C communications would increase the interference potential of unlicensed operations in other ways. As the FWCC explained, "Client-to-client operations would also change the assumed usage characteristics upon which the 6 GHz Order relied, including by increasing duty cycles, bringing VLP devices into proximity of windows or other areas with limited [building entry loss], and increasing the likelihood of an uncontrolled device transmitting within the boresight of licensed fixed service facilities."[8] Moreover, AT&T illustrated how C2C communications would "depart from, and thus render inapplicable, CableLabs' assumptions in the statistical model relied upon by the Commission to justify AFC-free operation of LPI RLAN devices in the 6 GHz band."[9] Specifically, AT&T observed that C2C could result in significant changes in power distribution of RLAN devices assumed by CableLabs by shifting the average power higher, as client devices adjust their power to communicate with each other depending on their separation distance. While Apple, Broadcom, et al, contend that C2C would improve spectral efficiency and reduce congestion by allowing *some* communications to occur with fewer transmissions, they obscure the reality that there will be more transmissions overall, using more frequencies, thereby increasing the duty cycle and the potential for interference to licensed microwave systems.[10]

C. Real-world interference testing is necessary prior to any further expanded unlicensed operations.

Given that C2C communications will increase the interference potential to licensed microwave systems, the Office of Engineering and Technology should refrain from any further expansion of

[8] Comments of the FWCC at 3.
[9] Comments of AT&T at 7.
[10] Comments of Apple, Inc. Broadcom, Inc., CommScope, Inc., Facebook, Inc., Google, LLC, Hewlett Packard Enterprise, Intel Corporation, Microsoft Corporation, and Qualcomm Incorporated in ET Docket No. 18-295 at 3 (filed Feb. 22, 2021).

unlicensed operations – including C2C – until real-world rigorous interference testing shows that unlicensed operations will not cause harmful interference to licensed microwave systems. As Southern emphasized, the proposal for C2C communications underscores the need for actual testing of unlicensed use of the 6 GHz band, which "may provide valuable guidance regarding possible options or opportunities for additional unlicensed use of the 6 GHz band, such as the appropriate parameters for allowing client-to-client device communications."[11] Similarly, the Alliance for Automotive Innovation stated that "[t]he Commission should also require more real-world testing on the likelihood of harmful interference from device-to-device communications before it takes action," and it explained that "[t]esting would help incumbent users analyze the likelihood and extent of interference."[12] These comments and those of others echoed that it would be premature to expand unlicensed device use absent real-world testing and technical showings regarding the proposal's impact for all users of the 6 GHz and adjacent bands.[13] As the Association of American Railroads and others noted, Congress and other federal agencies have also urged the Commission to conduct real-world testing of unlicensed operations in the 6 GHz band, which only further supports the comments on the record that also support this cautious approach going forward.[14] Therefore, the Office of Engineering and Technology should refrain from allowing C2C communications unless and until rigorous interference testing has shown that unlicensed operations will not cause harmful interference to licensed microwave systems.

II. The Record Lacks Sufficient Technical Support That C2C Communications in the 6 GHz band Will Not Cause Harmful Interference or Identify Sufficient Safeguards to Mitigate Interference.

[11] Comments of Southern Company at 6 and 7.
[12] Comments of the Alliance for Automotive Innovation in ET Docket No. 18-295 at 6-7 (filed Feb. 22, 2021).
[13] *Id. See also* Comments of NAB at 2-3; Comments of Sirius XM Radio, Inc. on Client-to-Client Communications in the 6 GHz Band in ET Docket No. 18-295 at 4 (filed Feb. 22, 2021); and Comments of the Association of American Railroads in ET Docket No. 18-295 at 2, 7, 10 and 12.
[14] Comments of the Association of American Railroads at 6. *See also* Comments of Southern Company at 6, *citing* Joint Explanatory Statement – Division E, at 32, available at https://docs.house.gov/billsthisweek/20201221/BILLS-116RCP68-JES-DIVISION-E.pdf)

Despite interference issues, proponents have not provided any technical information to demonstrate that C2C communications will not cause harmful interference and instead argue for the reduction or elimination of safeguards that might limit the interference potential of C2C communications. Specifically, they do not define the enabling signal and they also oppose defining C2C communications as a different class of unlicensed operation in the band. Furthermore, they propose the Commission should permit C2C communications if: (1) the client devices receive an enabling signal from the AP within the last four seconds; and (2) the receive-strength of the enabling signal is only -99 dBm/MHz or greater, either of which would allow C2C communications for far too long a time or far too long a distance from the AP to limit client devices from increasing the interference potential to licensed microwave systems in the band.

A. The FCC should not allow de facto daisy-chaining via C2C communications.

In the Public Notice, the Office of Engineering and Technology invited comments to define the enabling signal in terms of its characteristics, including similarities to or differences from other signals such as beacons that access points already use to connect with client devices, and the degree to which an enabling signal would tether a client device not under the direct control of an access point to that access point.[15] In response, proponents have not defined the enabling signal in any meaningful way, and they specifically oppose associating the enabling signal with any particular access point.[16] Relying on talismanic words and phrases like "technology neutral" and "innovation," proponents argue that any definition should only ensure proximity to an LPI AP by requiring that devices in C2C mode can decode an enabling signal of at least -99 dBm/MHz once every four seconds.[17] They apparently want to avoid tethering C2C communications to the enabling signal of a particular AP, and while they claim

[15] Public Notice at 2.
[16] Comments of Apple, Broadcom, et al. at 9-11 (urging the Commission to avoid defining the enabling signal in a way that would associate the signal with an AP.)
[17] *Id.* at 12.

doing so could be "cumbersome" for certain use cases, they fail to explain why it is necessary to eliminate any such safeguards, let alone whether doing so will protect licensed operations from harmful interference as a technical matter. While proponents claim that avoiding associating the enabling signal with a particular AP will prevent daisy chaining,[18] their unstated intent appears to be to enable C2C communications between one or a multitude of APs from which client devices might receive an enabling signal, resulting in a mesh networks of C2C communications that the Office of Engineering and Technology correctly observes would allow different client devices to communicate with other client devices in different rooms or different buildings.[19] It stretches credulity how this could not be reasonably considered daisy-chaining as a practical matter, and it is apparent that such C2C communications would clearly increase the interference potential to licensed microwave systems.[20]

B. The proposed four-second enabling signal detection interval is too long/ineffective and the receive-strength of the enabling signal is too low.

While proponents claim that interference can be mitigated by preventing C2C communications if the client devices are not capable of receiving a -99 dBm/MHz enabling signal within a four-second interval, these claims do not withstand any serious scrutiny. As AT&T observes, "four seconds appears to be too long a period for the intended purpose of keeping client devices close to their associated APs," because it is reasonably foreseeable that two client devices engaging in C2C communications by virtue of their association with an AP "could —at vehicular speeds—travel a significant distance away from the AP prior to the authorization 'expiring.'"[21] Instead of four seconds,

[18] *Id.*
[19] *See* Public Notice at 3 (inviting comment on whether the client devices should be limited to receiving an enabling signal from the same access point or whether client-to-client communications should be permitted so long as each client device receives an enabling signal from any authorized access point.) *See also Id.* (observing that "client devices in two different buildings receiving enabling signals from different low-power indoor access points could attempt to communicate with each other.")
[20] *See* Public Notice at 3 (asking whether permitting C2C communications between buildings would increase the potential for the client devices to cause harmful interference to licensed services.)
[21] Comments of AT&T at 6.

AT&T suggests a more frequent refresh of a minimum of five beacon transmissions in the most recent rolling one-second period, based upon the fact that Wi-Fi devices already use beacon signals set to default intervals of 102.4 milliseconds.[22] Similarly, the FWCC proposes that APs transmit an enabling beacon a number of times each second, and client devices should be required to detect at least half of the enabling beacons each second at or above the minimum threshold.[23]

In addition to the interval of the enabling signal being too long, the receive-strength suggested by the proponents is too low. It is reasonably foreseeable that such a weak signal of -99 dBm/MHz could result in LPI client devices operating outdoors, as OET pointed out in the Public Notice and as numerous comments agree.[24] As NAB stated, "a single LPI access point could authorize client-to-client operations across the vast interior spaces of most of the buildings in the world." Also, LPI access points could also authorize outdoor clients at a distance of 180 feet beyond the exterior building walls, based on the parameters of the RLAN proponent's proposal.[25] All of the comments recommend that the enabling signal strength should be adjusted to a higher value, and all of the comments recommend further testing is necessary and more real-world experience needs to be gained in order to determine the appropriate level at which the strength of the enabling signal should be set in order to reduce the interference potential.[26] Accordingly, the Office of Engineering and Technology should not adopt -99 dBm/MHz as the receive-strength of the enabling signal.

C. The proposal to use the enabling signal of any AP on any channel would significantly increase the interference potential of C2C communications.

Proponents also oppose tethering the clients to the same AP, claiming this would be

[22] *Id*.
[23] Comments of FWCC at 5.
[24] *See* Public Notice at 3. *See also* Comments of Southern Company at 4 *and* Comments of AT&T at 5.
[25] Comments of NAB at 5.
[26] *See e.g.* Comments of the Alliance for Automotive Innovation at 4; Comments of Association of American Railroads at 4-6; Comments of AT&T at 5-6; Comments of the FWCC at 4-6; Comments of NAB at 4-5; Comments of Nokia at 2; and Comments of Southern Company at 3-4.

unnecessarily complex, undermine the usability of C2C communications, and offer no material increase in protection against harmful interference. These arguments are baseless, contrary to common sense, and are contradicted by comments on the record that urge the Office of Engineering and Technology to condition any C2C communications – if permitted at all – upon client devices receiving an enabling signal from the same AP using the same channel.

As Nokia underscored, "the devices that engage in C2C communications must be under the control of the same low-power indoor AP or standard power AP," and "devices engaging in C2C communications must operate using the same frequency channels as their controlling AP employing contention-based schemes."[27] As AT&T observed, "given the prevalence of numerous identifiable Wi-Fi SSIDs that are available nearly ubiquitously in urban, suburban, and even some rural areas, a requirement that a client device must only be capable of receiving *any* AP enabling signal would be tantamount to having no controls in place whatsoever," and as such, C2C communications should be prohibited without AFC.[28] Similarly, the Alliance for Automotive Innovation explained, "permitting client devices to receive signals from different APs has real potential for creating Wi-Fi signal interference in areas where no interference should occur under the current rules," and "the Commission should also bar other configurations, such as allowing a client device controlled by a standard power AP to communicate with a client device controlled by a low-power indoor AP."[29] The Association of American Railroads also recommends requiring both client devices to be capable of the same two-way communications with an access point, including the same power, bandwidth, modulation, coding, and message content, and that both client devices must be capable of communicating with the same indoor

[27] Comments of Nokia at 2 and 3.
[28] Comments of AT&T at 10 (emphasis in original).
[29] Comments of Alliance for Automotive Innovation at 4.

low-power access point signal.[30] Finally, Southern and several other comments urge the Commission to require that the client device decode the access point ID from the initial signal detected on a periodic basis and that both clients in the client-to-client communication share that ID to ensure that both devices are communicating with the same access point. As Southern explains, "[t]his type of decoding and maintenance of the communication path would mitigate the ability of the client to move from client-to-client without limitations, and this functionality could be part of the testing of client-to-client operations."[31]

CONCLUSION

For all these reasons, 6 GHz Incumbent Stakeholders continue to oppose C2C communications and echo the overwhelming number of comments on the record that urge the Commission to continue to prohibit such operations in order to prevent interference to licensed microwave systems, at least until rigorous real-world testing is conducted and further experience has been gained with actual unlicensed operations that will inform the Commission whether and how to permit unlicensed operations in the 6 GHz band. Comments by proponents have failed to provide sufficient technical information to allay interference concerns – and they ask the Commission to eliminate safeguards which would only exacerbate the potential for interference.

6 GHz Incumbent Stakeholders reiterate that using the enabling signal from the access point to restrict client-to-client operations will not prevent client devices from being used out of compliance/outdoors, and the use of a weak -99 dBm/MHz enabling signal would clearly expand the effective range of the system, which would in turn increase the interference potential to licensed microwave systems. In turn, client-to-client operations will increase the duty cycle of the system as a

[30] Comments of the Association of American Railroads at 5. *See also* Comments of AT&T at 8 (stating that "A client device engaged in direct communications should be limited to the power level, power spectral density, bandwidth, channel selection, activity factor and modulation that would be employed by the device to otherwise communicate with the AP.")
[31] Comments of Southern Company at 3.

whole, which will further increase the interference potential to licensed microwave systems. Moreover, client-to-client operations would support portable operations, which would make it more difficult to identify and resolve interference from intermittent and transient sources, as previously described on the record by the 6 GHz Incumbent Stakeholders and other parties in this proceeding. Therefore, 6 GHz Incumbent Stakeholders respectfully request that the Office of Engineering and Technology continue to prohibit unlicensed client-to-client operations the 6 GHz band.

Respectfully,

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