1 ## IEEE P802.18
2 ## Radio Regulatory Technical Advisory Group (RR-TAG)

Proposed Comments on FCC Second Further Notice of Proposed Rulemaking for 6GHz U-NII				
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4 This document drafts a proposed comments on the United States Federal Communications Commission (FCC) Second Further Notice of Proposed Rulemaking for 6 GHz.

5   Electronic filing   March 27, 2024
6
7   Re: Unlicensed Use of the 6 GHz Band and Expanding Flexible Use in Mid-Band Spectrum
8   Between 3.7 and 24 GHz (ET Docket No. 13–115 and RM–11341)
9
10   Dear Commission's Secretary, Office of the Secretary, Federal Communications Commission,
11
12   IEEE 802 LAN/MAN Standards Committee (LMSC) thanks the Federal Communications
13   Commission (FCC) for issuing the call for comments on "Unlicensed Use of the 6 GHz Band and
14   Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz (ET Docket No. 13–
15   115 and RM–11341)" and for the opportunity to provide feedback.
16
17   IEEE 802 LMSC is a leading consensus-based industry standards body, producing standards for
18   wireless networking devices, including wireless local area networks ("WLANs"), wireless
19   specialty networks ("WSNs"), wireless metropolitan area networks ("Wireless MANs"), and
20   wireless regional area networks ("WRANs"). We also produce standards for wired Ethernet
21   networks, and technologies produced by implementers of our standards are critical for all
22   networked applications today.
23
24   IEEE 802 LMSC is a committee of the IEEE Standards Association and Technical Activities, two
25   of the Major Organizational Units of the Institute of Electrical and Electronics Engineers (IEEE).
26   IEEE has about 400,000 members in over 160 countries. IEEE's core purpose is to foster
27   technological innovation and excellence for the benefit of humanity. In submitting this document,
28   IEEE 802 LMSC acknowledges and respects that other components of IEEE Organizational Units
29   may have perspectives that differ from, or compete with, those of IEEE 802 LMSC. Therefore,
30   this submission should not be construed as representing the views of IEEE as a whole[1].
31
32   Please find below the IEEE 802 LMSC's comments on this consultation.
33
34   **General and Summary Comments**
35   IEEE 802 LMSC closely follows FCC regulatory activities regarding radio local area network
36   (RLAN) and strongly supports FCC proceedings on enabling Very Low Power (VLP) and Client
37   to Client (C2C) communications in the 5925 MHz to 7125 MHz band (a.k.a. 6 GHz). More
38   specifically, IEEE 802 LMSC recognizes that Part 15 Subparts C, E, and F are relevant to the IEEE
39   802 standards.
40
41   Building on the United States of America's leadership on Low Power Indoor (LPI) and Standard
42   Power (SP) at 6 GHz band, we believe that enablement of Peer-to-Peer (P2P) communications is
43   the natural next step in optimum utilization of the 6 GHz spectrum through multi-modal regulatory
44   framework. More specifically, we believe that enabling VLP and C2C modes in the 6 GHz band
45   is critical in supporting a comprehensive set of use cases and enabling the relevant segment of
46   industries. VLP and C2C modes of communications offer means for spectral and power efficient
47   operation that may be otherwise infeasible or inefficient specially for Real Time Applications
48   (RTA) such as real time gaming, cloud gaming, real time video, and robotics and industrial

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[1] This document solely represents the views of IEEE 802 LMSC and does not necessarily represent a position of either the IEEE or the IEEE Standards Association or the IEEE Technical Activities.

49 automation. These applications typically have stringent latency, throughput, and determinism
50 performance requirement on the same or various traffic channels enabling the RTA use-cases[2].
51
52 IEEE 802 LMSC welcomes and applauds the Commission's decision on authorizing VLP
53 operation in the U-NII-5 and U-NII-7 bands. We strongly support the Commission to permit VLP
54 devices to also operate in the UNII-6 and U-NII-8 bands without geo-fencing. IEEE 802 LMSC
55 supports the Commission's consideration for increasing maximum VLP transmit power level but
56 recommends increasing the maximum power spectral density for VLP to 1 dBm/MHz without geo-
57 fencing capability restriction. IEEE 802 LMSC supports VLP operation with geo-fencing
58 capability at higher power of up to 21 dBm.
59
60 IEEE 802 LMSC notes the Commission addressing of the prohibition of direct communication of
61 6 GHz unlicensed client devices and the proposed exceptions at 14 dBm power level. IEEE 802
62 LMSC appreciates the exceptions but believes that enabling various use cases for P2P
63 communication require higher power than 14 dBm. More specifically IEEE 802 LMSC agrees
64 that the Commission should permit direct communications between clients of indoor access points
65 at allowable maximum power levels associated with the indoor access points' clients.
66
67 IEEE 802 LMSC recommends the Commission to continue its leadership in enabling 6 GHz
68 unlicensed operation by promoting global harmonization of regulatory requirements for VLP and
69 C2C.
70
71 IEEE 802 family of standards, including IEEE 802.11-2020, IEEE 802.11ax-2021, IEEE
72 802.11az-2022, IEEE P802.11 and IEEE P802.11be, are the basis for suite of P2P communications
73 technologies developed by the industry. In particular, Wi-Fi Alliance's Wi-Fi Direct[®3], Wi-Fi
74 Aware[TM 4] and Augmented/Virtual/Mixed Reality (AR/VR/MR)[5] related activities are targeting
75 enablement of various P2P applications and uses cases. These Wi-Fi technologies are using IEEE
76 802.11 standards for device addressing and device discovery, service discovery, P2P Group
77 Operation, P2P Power Management, P2P Co-existence Operation, Security, Ranging, and Fine
78 Time Measurement, and enables mobile phones, PCs, head-mounted displays (HMD), displays,
79 speakers, cameras, printers, gaming devices, and other consumer products to initiate and stablish
80 Wi-Fi networks without the need for network infrastructure, internet connection, or GPS signal.
81
82 IEEE P802.11 specifically provisioned regulatory classification for the 6 GHz band not only for
83 LPI and SP modes but also for VLP and C2C operations so that the compliant devices can properly
84 signal their regulatory capabilities according to their certification status for regulatory compliant
85 interoperation when operating in VLP or C2C modes.

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[2] IEEE 802.11 Real Time Application Topic Interest Group Report, https://mentor.ieee.org/802.11/dcn/18/11-18-2009-06-0rta-rta-report-draft.docx
[3] Wi-Fi CERTIFIED Wi-Fi Direct® enables Wi-Fi devices to connect directly to each other, making it simple and convenient to print, share, sync, play games, and display content to another device. Wi-Fi Direct devices connect to one another without joining a traditional home, office, or public network. See Discover Wi-Fi: Wi-Fi Direct. Available online [Accessed: 14 March 2024]
[4] Wi-Fi CERTIFIED Wi-Fi Aware™ extends Wi-Fi® capability with quick discovery, connection, and data exchange with other Wi-Fi devices—without the need for a traditional network infrastructure, internet connection, or GPS signal. Wi-Fi Aware™ provides rich here-and-now experiences by establishing independent, device-to-device Wi-Fi connections based on a user's immediate location and preferences. Examples of Wi-Fi Aware[TM] use cases are unsynchronized device discovery, security enhancement, and AR/VR/MR. See Discover Wi-Fi: Wi-Fi Aware. Available online [Accessed: 14 March 2024]
[5] Wi-Fi Alliance: Discover Wi-Fi: XR. Available online [Accessed: 14 March 2024]

86
87   In addition, we would like to bring to the Commission attention that, IEEE 802 LMSC has been
88   conducting different studies on real time communication and low latency communication to
89   support applicability of IEEE 802 family of standards in these areas. As examples, we would like
90   to list the IEEE 802.11 Real Time Application Topic Interest Group Report[6] and IEEE 802.24 Low
91   Latency Communication White Paper[7]. Please note that these are some sample projects and reports
92   that are not only applicable to P2P communication and not necessarily covering all P2P use cases.
93
94   **Expanding Very Low Power Operations to U-NII-6 and U-NII-8**
95   IEEE 802 LMSC strongly supports the Commission's proposal to expand VLP operation to the U-
96   NII-6 and U-NII-8 bands. Authorizing all 6 GHz sub-bands is critical in fully enabling latency
97   sensitive high throughput applications like real time Extended Reality (AR/VR/XR) for health,
98   education and gaming, robotics and industrial automation. In particular, enabling relevant
99   application in dense residential environment and also to enable scaling of applications in enterprise
100 and industrial when multiple of these application sessions has to support simultaneously and in
101 close proximity. Therefore, it is essential to extend the VLP operation to both the U-NII-6 and the
102 U-NII-8 bands to enable the maximum number of 160 MHz and 320 MHz channels.
103
104 The characteristics of incumbent Fixed Services and Fixed Satellite Services is very similar
105 throughout the 6 GHz band on the U-NII-5 and U-NII-7 bands as well as the U-NII-6 and U-NII-
106 8 bands and the same level of protection from VLP operation is achievable on the U-NII-6 and U-
107 NII-8 bands. Therefore, there is no risk of harmful interference in the U-NII-6 and U-NII-8 bands
108 similar to that of the U-NII-5 and U-NII-7 bands. Industry analysis and studies are conducted to
109 demonstrate that there are no harmful interference to incumbent fixed services[8].
110
111 IEEE 802 LMSC also believes that the VLP implementations can effectively protect the electronic
112 news gathering operation in the U-NII-6 and U-NII-8 bands. More specifically, characteristics of
113 Fixed ENG central receive sites are similar to those of Fixed Services and therefore, the same
114 analysis and studies show that there is no risk of harmful interference to the central receive sites.
115 As related to the mobile ENG receivers are concerned, we believe that the combination of low
116 transmit power level of VLP, contention-based mechanism, and TPC will minimize any possible
117 risk of harmful interference to these mobile receivers.
118
119 **Increasing Maximum Power Spectral Density of VLP Devices**
120 IEEE 802 LMSC welcomes the Commission proposal for improving VLP performance by
121 increasing maximum PSD for VLP devices to 1 dBm/MHz limited to 14 dBm. With this change,
122 the maximum transmit power is only increased for 20 MHz and 40 MHz channel bandwidth sizes
123 to 14 dBm matching that for 80 MHz, 160 MHz, and 320 MHz channels. As a result, there is only
124 a limited incremental performance improvement for a number of applications that use smaller
125 channel sizes. IEEE 802 LMSC welcomes this increase in the PSD level as it also harmonizes
126 VLP transmit power in the United States of America with that in other countries and regions

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[6] IEEE 802.11 Real Time Application Topic Interest Group Report, https://mentor.ieee.org/802.11/dcn/18/11-18-2009-06-0rta-rta-report-draft.docx
[7] IEEE 802.24 Vertical Applications Technical Advisory Group Low Latency Communication White Paper, https://mentor.ieee.org/802.24/dcn/23/24-23-0010-06-0000-low-latency-communication-white-paper-word-for-comment.docx
[8] VLP/FS Interaction Study, Monte Carlo Simulation of the San Francisco Metro Area, Letter from Paul Caritj, Counsel to Apple Inc., Broadcom Inc., Google LLC, Meta Platforms, Inc., and Microsoft Corporation to Marlene H. Dortch, Sec'y, FCC, ET Docket No.18-295, GN Docket No. 17- 183 (filed Feb. 28, 2023)

127   including Europe and hence greatly contribute to global harmonization of VLP devices. H aving
128   said that, IEEE 802 LMSC believes that the Commission should not require any geo-fencing
129   capability as we do not believe that the minimal elevation of the PSD for 20 MHz and 40 MHz
130   transmissions would cause any risk to incumbent services especially as these smaller channel
131   bandwidth sizes may not be widely used in the 6 GHz band domestically when wider 6 GHz
132   channels are available and devices also have the option to use 20 MHz and 40 MHz channels in
133   the 5 GHz band at higher transmit power level. While IEEE 802 LMSC recognizes and appreciates
134   the Commission initiative in developing the proposed geo-fencing regulatory framework for VLP,
135   we do not believe that the incremental improvement justifies mandating the relatively complex
136   mechanism for VLP applications that are expected to be simple by nature and low cost. In addition,
137   detailing out the geo-fencing system along with its database requirement and development of the
138   compliance mechanism will be time consuming and is potentially a cause of delay in deployment
139   of this VLP mode.
140
141   Having said that, IEEE 802 LMSC welcomes the Commission consideration of geo-fencing
142   mechanism and supports VLP operation with geo-fencing capability at higher power of up to 21
143   dBm.
144

145   **Authorizing C2C Communications**
146   IEEE 802 LMSC believes that permitting client-to-client (C2C) communications when those
147   devices are under the control of an indoor access point or after they have received an enabling
148   signal from an indoor access point is critical in enabling a new class of P2P applications. Not
149   allowing direct communication between client devices and unnecessarily requiring all traffic to go
150   through access points would significantly degrade the throughput-latency performance of the
151   carrying communication link in a number of important applications such as Extended Reality (XR)
152   applications and hence impacting the performance and user experience. In addition, such
153   restriction limits the scaling of the services, increases the system interference and channel access
154   overhead and is energy inefficient as communications through access points require more power
155   consumption and higher airtime.
156
157   In addition, some applications such as sensing, and proximity-based applications are inherently
158   P2P and are only relevant when implemented between client devices directly without access point
159   involvement.
160
161   IEEE 802 LMSC believes that permitting client devices to directly communicate with each other's
162   at LPI power level considerably increases the range of Extended Reality based applications and
163   properly matching the typical indoor classroom sizes and open space office areas used in
164   education, health and IoT industry deployments. Without a C2C option at LPI power level, the
165   range and overall performance of such applications would be very limited due to limitation in the
166   VLP power level. In addition, C2C communication makes it possible for P2P networks to operate
167   independently from and in different channels than that of Wi-Fi networks using infrastructure
168   access points.   This way, the two networks can coordinate channels for optimum spectrum
169   utilization.   IEEE 802 LMSC supports authorizing C2C communication at 24 dBm and -1
170   dBm/MHz align with that of LPI clients when communicating with access point.
171
172   IEEE 802 LMSC notes OET recent approval of AFC Systems to supervise SP operation in the
173   6GHz band. While we applaud the FCC and OET on this achievement, we expect the early SP
174   deployments to be indoor and supported through Composite LPI/SP access points. Therefore, it
175   is critical that the Commission moves to authorize C2C communication between client devices

176 under the control of LPI or Composite access points or after they have received an enabling signal
177 from LPI or Composite access points.

178

179 IEEE 802 LMSC supports requiring an enabling signal threshold of -82 dBm/20MHz for C2C
180 operation. This threshold is 4 dB higher and hence more conservative relative to the previously
181 proposed numbers by the industry also mentioned in the 2nd FNPRM. IEEE 802 LMSC's
182 understanding is that this higher threshold is adopted by Japan's MIC as technical condition for 6
183 GHz C2C[9] and also under consideration in ETSI BRAN[10]. At this threshold level, the C2C
184 coverage is restricted well within the LPI coverage area and hence the risk for any harmful
185 interference is negligible. Although IEEE 802.11 receiver sensitivity requirement specifies a
186 threshold of -82 dBm for MCS0, this requirement is based on a very conservative assumption of
187 10 dB noise figure and 5 dB implementation margin. Receiver characteristics of typical complying
188 devices to the IEEE 802.11 specification perform considerably better on both noise figure and
189 implementation margin.

190

191 IEEE 802 LMSC believes that permitting C2C communications in other channels than the channels
192 associated with the enabling access points is a fundamental advantage that C2C mode can offer.
193 More specifically, clients enabled by an LPI access point can use any channels in the 6 GHz band
194 and clients enabled by a Composite access point in SP mode can use any channel authorized by
195 the AFC System. We believe that there would be no harmful interference to incumbent services
196 from C2C communications due to this flexibility in channel usage as both clients are complying
197 with all applicable regularity restrictions, if not more, while operating in C2C mode. The flexibility
198 in channel usage, makes it possible to coordinate C2C channels with infrastructure access point
199 and hence minimize interference, reduce unnecessary channel access overhead and contention and
200 hence optimize spectrum utilization and better overall QoS.

201

202 IEEE 802 LMSC supports the industry proposed four second interval as the maximum recheck
203 interval for the enabling signal strength measurement. We believe that a four second interval is a
204 proper tradeoff for disabling the C2C communications quickly enough when a potential client
205 device is moved away from indoor while controlling design complexity and minimizing
206 performance degradation. This is especially important when clients are using other channels for
207 the C2C communication then the enabling access point channel and the device needs to recheck
208 the enabling signal strength periodically.

209

210 IEEE 802 LMSC believes that the Commission shall not impose the same access point restriction
211 for enabling of the two clients. This is particularly important in enterprise deployments when there
212 is a considerable chance that close by clients being under control of or subject of enabling by
213 different but adjacent access points. Although we do not believe there would be any risk of harmful
214 interference to incumbent services due to this flexibility, out of an abundance of caution, the
215 Commission may consider limiting the enabling signals from access points with the same network
216 (SSID).

217

218 IEEE 802 LMSC recognizes that FNPRM is focusing on the method based on control of or
219 reception of an enabling signal from indoor APs to verify that C2C communications remains
220 indoor. As it is commented earlier, IEEE 802 LMSC supports that and providing comments on
221 that regard. Having said that, IEEE 802 LMSC recommends that the Commission to draft the rule

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[9] Japan MIC, Technical Condition https://www.soumu.go.jp/main_content/000901042.pdf
[10] Draft ETSI EN 202 687 v0.0.18 6 GHz WAS/RLAN Harmonized Standard for Access to Radio Spectrum

222 language in a way that provides the option for compliance by alternative advanced technologies
223 and methods, than utilizing the enabling signal, to demonstrate indoor operation.
224
225 **Conclusion**
226 IEEE 802 LMSC supports enabling P2P communications at 6 GHz through authorization of VLP
227 and C2C regulatory modes. In particular,
228 - We strongly support the Commission to permit VLP devices to also operate in the U-NII-
229   6 and U-NII-8 bands without geo-fencing.
230 - We support the Commission's consideration for increasing maximum VLP transmit power
231   level but recommends increasing the maximum power spectral density for VLP to 1
232   dBm/MHz without geo-fencing capability restriction.
233 - We support VLP operation with geo-fencing capability at higher power of up to 21 dBm.
234 - We support the Commission's decision to authorize C2C communication at 24 dBm and -
235   1 dBm/MHz align with that of LPI clients when communicating with access point, and we
236   recommend that the Commission to draft the rule language in a way that provides the option
237   for compliance by alternative advanced technologies and methods, than utilizing the ena-
238   bling signal, to demonstrate indoor operation.
239
240 We respectfully request the Commission to consider our comments listed in this response. We
241 hope that the new regulation will be enacted in a timely manner.
242
243 Respectfully submitted
244
245 By: /ss/.
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247 IEEE 802 LAN/MAN Standards Committee Chairman
248 em: p.nikolich@ieee.org
249