

1
2

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

Proposed Response to Thailand NBTC's consultation re: technical requirements on the lower 6 GHz band

Date: 2024-04-11

Author(s):

Name	Company	Address	Phone	email
Hassan Yaghoobi	Intel			hassan.yaghoobi@intel.com
Edward Au	Huawei			edward.ks.au@gmail.com
Gaurav Patwardhan	Hewlett Packard Enterprise			gauravpatwardhan1@gmail.com

3

4

This document drafts a proposed response to the Thailand NBTC's consultation on the draft amendment to technical standards for telecommunications equipment and equipment using the frequency 5.925 GHz – 6.425 GHz.

Notice: This document has been prepared to assist IEEE 802.18. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

5 Electronic filing

May 1, 2024

6
7 Re: Consultation on the draft amendment to technical standards for telecommunications
8 equipment and equipment using the frequency 5.925 GHz – 6.425 GHz.

9
10 Dear Chairman,

11
12 IEEE 802 LAN/MAN Standards Committee (LMSC) thanks the Thailand National Broadcasting
13 and Telecommunications Commission (NBTC) for issuing the consultation on draft amendment
14 to technical standards for telecommunications equipment using the frequency 5.925 GHz – 6.425
15 GHz and for the opportunity to provide feedback on this important topic.

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 whole¹.

31
32 Please find below the responses of IEEE 802 LMSC to this consultation.

33
34 ***IEEE 802.11 and IEEE 802.15 based devices are already operating in the 6 GHz band***

35
36 *IEEE 802.11*

37
38 The IEEE Std 802.11ax-2021 standard² supports operation in the 2.4 GHz, 5 GHz, and 6 GHz
39 bands, and products based on this standard are seeing significant adoption where regulatory rules
40 permit deployment³. Based on IEEE Std 802.11ax-2021, the Wi-Fi industry is taking the lead in
41 developing Wi-Fi 6E certification program and specifying a number of complementary
42 coexistence strategies for bands with incumbent users, such as automated frequency coordination
43 (AFC)^{4,5} for the entire 6 GHz band (i.e., 5.925 GHz to 7.125 GHz). Wi-Fi technology, based on
44 the IEEE 802.11 standard, has an estimated 19.5 billion devices in use world-wide, with over 4

¹ This document solely represents the views of IEEE 802 LMSC and does not necessarily represent a position of either the IEEE, the IEEE Standards Association.

² “IEEE Standard for Information Technology - Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks - Specific Requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 1: Enhancements for High-Efficiency WLAN,” in IEEE Std 802.11ax-2021 (Amendment to IEEE Std 802.11-2020), vol., no., pp.1-767, 19 May 2021, doi: 10.1109/IEEESTD.2021.9442429.

³ Wi-Fi Alliance: Wi-Fi 6E momentum underscores need for entire 6 GHz band, November 2022. [Available online](#) [accessed: 10 April 2024].

⁴ Dynamic frequency coalition: Automated frequency coordination - an established tool for modern spectrum management, March 2019. [Available online](#) [accessed: 10 April 2024].

⁵ Intel: Spectrum sharing using automated frequency coordination. [Available online](#) [accessed: 10 April 2024].

45 billion devices added annually⁶. In addition, the list of Wi-Fi 6E certified products⁷ (which are
46 also based on IEEE 802.11 technologies) is growing. By the end of 2023, over 473 million Wi-Fi
47 6E devices entered the market⁸.

48

49 A new generation of IEEE 802.11 technologies, currently under development in the IEEE
50 P802.11be amendment⁹, will continue to improve performance and enhance spectrum coexistence
51 capacities. To achieve the targeted performance improvements, IEEE P802.11be introduces
52 advanced features including channel bandwidths of up to 320 MHz, multiple resource units to a
53 single station, multi-link operation, enhanced quality of service (QoS), improved Target Wake
54 Time, and improved spectrum management by spectrum puncturing to accommodate coexistence
55 with incumbents more effectively and efficiently. Please note that the P802.11be amendment
56 currently supports carrier frequency operation between 1 GHz and 7.125 GHz with extension to
57 7.250 GHz under consideration.

58

59 IEEE 802.15

60

61 Ultra-Wideband (UWB) technology, which is specified in IEEE 802.15 standards, is finding
62 adoption for numerous short-range sensing and ranging applications. IEEE Std 802.15.4-2020¹⁰
63 and IEEE Std 802.15.4z-2020¹¹ are standards for precision ranging that are capable of using both
64 the 6 GHz and 7 GHz frequency bands and are increasingly used in many high value applications.
65 The capability of IEEE Std 802.15.4z-2020 to support secure ranging has led to a renewed interest
66 in UWB from both industry and regulators. The automotive industry was the driving force behind
67 IEEE Std 802.15.4z-2020 and the first to include UWB in consumer products. Mobile handset
68 makers have followed closely. This is generating significant economic and social value, attracting
69 further interest in developing future UWB standards.

70

71 IEEE P802.15.4ab¹² is being developed (as the next generation of UWB technology) based on
72 industry needs to fuel the next round of innovative products. The project is built on IEEE Std
73 802.15.4z-2020 which is capable of using both the 6 GHz and 7 GHz frequency bands and has
74 been widely implemented and is supported by a rich ecosystem of industry alliances, silicon
75 vendors and product developers. New developments supported by the project include features to
76 improve link budget, reduce air-time, sensing capabilities to support presence detection and
77 environment mapping, improved accuracy, precision and reliability for high-integrity ranging,
78 interference mitigation techniques to support greater device density and higher traffic use cases
79 and provide improved coexistence in the presence of other services in support of different
80 regulatory regions, additional means to reduce complexity and power consumption, enhance
81 support for ultra low power, low latency streaming, while ensuring compatibility with the deployed
82 base of products based upon IEEE Std 802.15.4z-2020. In addition, the project is built on the
83 IEEE Std 802.15.4-2020 standard that supports peer-to-peer, peer-to-multi-peer, and station-to-
84 infrastructure topologies and includes enhanced infrastructure synchronization mechanisms.

⁶ Wi-Fi Alliance: Value of Wi-Fi. [Available online](#) [accessed: 10 April 2024].

⁷ Wi-Fi Alliance: Wi-Fi 6E certified products. [Available online](#) [accessed: 10 April 2024].

⁸ Wi-Fi Alliance: Wi-Fi 6E insights. [Available online](#) [accessed: 10 April 2024].

⁹ "IEEE Draft Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment: Enhancements for Extremely High Throughput (EHT)," in IEEE P802.11be/D5.0, November 2023, vol., no., pp.1-1045, 3 Jan. 2024.

¹⁰ "IEEE Standard for Low-Rate Wireless Networks," in IEEE Std 802.15.4-2020 (Revision of IEEE Std 802.15.4-2015), vol., no., pp.1-800, 23 July 2020, doi: 10.1109/IEEEESTD.2020.9144691.

¹¹ "IEEE Standard for Low-Rate Wireless Networks--Amendment 1: Enhanced Ultra Wideband (UWB) Physical Layers (PHYs) and Associated Ranging Techniques," in IEEE Std 802.15.4z-2020 (Amendment to IEEE Std 802.15.4-2020), vol., no., pp.1-174, 25 Aug. 2020, doi: 10.1109/IEEEESTD.2020.9179124.

¹² IEEE P802.15.4ab. [Available online](#) [accessed: 10 April 2024].

85

86 *It is the right time to update the technical requirements to operate in 5.925 GHz to 6.425 GHz*
87 *frequency band in Thailand*

88

89 As recognized in this proceeding, NBTC have already allocated 5.925 GHz to 6.425 GHz for
90 license-exempt operation, which will create economies of scale and produce a robust equipment
91 market, benefitting Thailand's businesses, consumers, and the economies as well as increasing the
92 societal benefits in Thailand. IEEE 802 LMSC commends NBTC's leadership and effort.

93

94 In addition, IEEE 802 LMSC kindly requests NBTC to actively pursue enablement of other modes
95 of operation in the 5.925 GHz to 6.425 GHz band, including Standard Power (SP) mode under
96 supervision of an AFC system in the complying devices that are supported by IEEE 802.11
97 standard. AFC can be considered as the state-of-the-art mitigation technique to protect incumbent
98 services for outdoor and indoor operation at standard power level. SP mode enables Wi-Fi
99 operation at higher power than VLP mode outdoor and higher power than LPI mode indoor to
100 optimally utilize the 6 GHz spectrum. IEEE 802 LMSC believes that an AFC System, as an
101 effective automated spectrum sharing technology, is critical in enabling essential Wi-Fi technology
102 applications and use cases not only for outdoor operation but also indoor operation at standard
103 power level.

104

105 Authorizing SP mode at a maximum EIRP of 36 dBm for access points and 30 dBm for client
106 devices for indoor and outdoor operation enables many key applications including next-generation
107 mixed reality experiences like metaverse¹³, multigigabit per second outdoor coverage (e.g., parks,
108 stadiums), multi-gigabit point-to-multipoint connectivity, low-latency applications like industrial
109 IoT, and Voice over IP (Wi-Fi calling). SP operation also improves indoor Wi-Fi performance to
110 match coverage performance of the 5 GHz band. The USA and Canada have already authorized
111 SP mode and started certification of AFC systems. The certification process for AFC system and
112 device is based on the industry developed recommended compliance specification^{14,15,16}. On 23
113 February 2024, Federal Communications Commission (FCC) announced¹⁷ approval of seven AFC
114 systems for commercial operation. A number of AFC devices and Fixed Client devices are already
115 certified too. Many other countries including Brazil, Saudi Arabia, South Korea, and Japan are
116 studying enablement of SP mode.

117

118 As it is stated in previous communications with NBTC, IEEE 802 LMSC supports allocation of
119 upper 6 GHz (i.e., 6.425 GHz – 7.125 GHz) band for unlicensed operation and we look forward to
120 NBTC's leadership and effort in achieving this objective.

121

122 **Conclusion**

123

124 IEEE 802 LMSC thanks NBTC for the opportunity to provide this submission. We support the
125 proposed change on technical requirements and kindly request NBTC to consider our responses in
126 its future decisions regarding the authorization of Standard Power mode at a maximum EIRP of
127 36 dBm for access points and 30 dBm for client devices for indoor and outdoor operation under
128 an AFC supervision.

¹³ NBTC press release on metaverse. [Available online](#) [accessed: 10 April 2024].

¹⁴ Wi-Fi Alliance: AFC Specification and Test Plans. [Available online](#) [accessed: 10 April 2024].

¹⁵ Wireless Innovation Forum: Specifications. [Available online](#) [accessed: 10 April 2024].

¹⁶ Wi-Fi Alliance: 6 GHz AFC resources. [Available online](#) [accessed: 10 April 2024].

¹⁷ Federal Communications Commission: OET announces approval of seven 6 GHz band automated frequency coordination systems for commercial operation and seeks comment on C3 Spectra's proposed AFC system. [Available online](#) [accessed: 10 April 2024].

129
130 Respectfully submitted
131
132 By: /ss/.
133 James Gilb
134 IEEE 802 LAN/MAN Standards Committee Chairman
135 em: gilb_ieee@tuta.com