

Re: Consultation “Five-year spectrum outlook 2024–29 and 2024–25 work program, Draft for consultation”

Dear Manager of Spectrum Licensing Policy Section,

IEEE 802 LAN/MAN Standards Committee (LMSC) thanks the Australian Communications and Media Authority (ACMA) for issuing the consultation “Five-year spectrum outlook 2024–29 and 2024–25 work program” and for the opportunity to provide feedback on this draft outlook and work program.

IEEE 802 LMSC is a leading consensus-based industry standards body, producing standards for wireless networking devices, including wireless local area networks (“WLANs”), wireless specialty networks (“WSNs”), wireless metropolitan area networks (“Wireless MANs”), and wireless regional area networks (“WRANs”). We also produce standards for wired Ethernet networks, and technologies produced by implementers of our standards are critical for all networked applications today.

IEEE 802 LMSC is a committee of the IEEE Standards Association and Technical Activities, two of the Major Organizational Units of the Institute of Electrical and Electronics Engineers (IEEE). IEEE has about 400,000 members in over 160 countries. IEEE’s core purpose is to foster technological innovation and excellence for the benefit of humanity. In submitting this document, IEEE 802 LMSC acknowledges and respects that other components of IEEE Organizational Units may have perspectives that differ from, or compete with, those of IEEE 802 LMSC. Therefore, this submission should not be construed as representing the views of IEEE as a whole¹.

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

A. Five-year spectrum outlook 2024–29

Wi-Fi provides significant societal and economic value to Australia

IEEE 802 LMSC noted the recognition of Wi-Fi technology in the 2024 State of Australia’s Regions report². As reported in Mapping the Digital Gap: 2023 Outcome Report³, IEEE 802.11 based Wi-Fi technologies brings unique and almost exclusive improvements to access and affordability measures as the suitable complement to full-fibre upgrades in regional Australia.

Significant global deployment of Wi-Fi, which are based on IEEE 802.11 technologies, are evident by the data that there are currently an estimated 19.5 billion devices in use in 2023 and there are

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.

² See page 44 of the report, <https://www.infrastructure.gov.au/sites/default/files/documents/state-of-australias-regions-2024.pdf> [accessed: 27 April 2024] (“As part of the Better Connectivity Plan, grants under Round 3 of the Regional Connectivity Program and Round 7 of the Mobile Black Spot Program were announced in December 2023, and will provide \$170.2 million for 136 projects. These aim to narrow the digital divide in rural and regional communities, providing investment to improve mobile coverage issues, fund public Wi-Fi, and deliver fibre upgrades.”)

³ See page 41 of the report, <https://apo.org.au/sites/default/files/resource-files/2023-09/apo-nid324397.pdf> [accessed: 27 April 2024] (“The Importance of Wi-Fi in Remote First Nationals Communities”).

over 473 million Wi-Fi CERTIFIED 6E devices entered the market by the end of 2023⁴. In addition, significant economic value is provided by Wi-Fi to the Australia's economies: the economic value reached USD \$34.7 billion in 2021, and is expected to increase by 20% to USD \$42 billion by 2025⁵.

Wi-Fi also contributes significant sustainability value to Australia

Australia has been investing heavily on its full-fibre NBN upgrades in regional Australia. The NBN-enabled internet not only provides positive economical outcomes to the country, but also brings a positive environmental outcome⁶.

Fibre-enabled Wi-Fi networks contributes to environmental sustainability⁷ since fibre optics is energy efficient for transmitting data over long distances and IEEE 802.11 based Wi-Fi technologies already and continue to provide a rich toolbox of energy efficient features. For example, the IEEE Std 802.11ax-2021 standard⁸ (also known as Wi-Fi 6) introduces a new feature, namely broadcast Target Wake Time (TWT), as an energy-efficient scheduling mechanism for transmissions between an AP and a wireless client. It has the advantage of allowing larger throughput while lowering latency since both devices are not only be aware of when transmissions will be made, but also enable energy efficiency since the devices can be idle or quiet when transmissions do not need to be made. Wi-Fi 7 specification built on IEEE P802.11be project⁹ specifies multi-link operation (MLO), which defines an energy-efficient way for an AP to coordinate traffic management over several bands with a multi-link device (MLD). If such an MLD is capable of simultaneously sending traffic on links operating at 2.4 GHz, 5 GHz and 6 GHz bands, but the current load on the network is such that only one or two of these links are necessary to provide a robust service level, the other one or two links can be quieted and/or can be in power save mode dynamically. The links can be un-quieted once the load on the network increases, with the result that the radios consume only the amount of energy they need for a given traffic load.

B. 2024–25 Annual Work Program: 6 GHz (5925 MHz – 7125 MHz)

Authorize LIPD Class Licence operation in the upper 6 GHz (6425 MHz –7125MHz) band

As recognized in the paper “Proposed updates to the LIPD Class Licence for 6 GHz RLANs Outcomes paper”¹⁰, there is a strong argument for the introduction of arrangements for RLANs across the entire 6 GHz band.

⁴ See Wi-Fi Alliance: Wi-Fi® by the numbers: Technology momentum in 2023, <https://www.wi-fi.org/beacon/the-beacon/wi-fi-by-the-numbers-technology-momentum-in-2023> [accessed: 27 April 2024].

⁵ See Wi-Fi Alliance: Global economic value of Wi-Fi® to reach \$5 trillion in 2025, https://www.wi-fi.org/system/files/Economic_Value_of_Wi-Fi_Highlights_202305.pdf [accessed: 27 April 2024].

⁶ See page 53 of “The economic and social impact of investment in the nbn network Methodology Report January 2024”, <https://www.nbnco.com.au/content/dam/nbn/documents/about-nbn/reports/reports-and-publications/accnture-2024-economic-and-social-impact-methodology-report.pdf.coredownload.pdf> [accessed: 6 April 2024] (“How nbn-enabled internet impacts environmental outcomes”)

⁷ See pages 35 and 36 of the WIK Consult: Sustainability Benefits of 6 GHz Spectrum Policy, Study for Wi-Fi Alliance, July 2023, <https://www.wi-fi.org/system/files/SustainabilityBenefitsof6GHzSpectrumPolicy202307.pdf> [accessed: 27 April 2024]

⁸ See “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.

⁹ See “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 See page 6 of “Proposed updates to the LIPD Class Licence for 6 GHz RLANs Outcomes paper” <https://www.acma.gov.au/sites/default/files/2022->

In January 2024, Wi-Fi Alliance introduced¹¹ Wi-Fi CERTIFIED 7™ based on IEEE P802.11be technology¹². With Wi-Fi 7 products already in the market, Wi-Fi deployments are going through a second generation upgrade in the entire 6 GHz band globally¹³ and there are no good reasons to defer a decision on the upper 6 GHz band. IEEE 802 LMSC reiterates its recommendation made in 2023¹⁴ to authorize LIPD Class Licence operation in the upper 6 GHz (6425 MHz – 7125 MHz) band.

Initiate authorization proceedings for ‘standard’ power RLAN under supervision of AFC

IEEE 802 LMSC, in its response to the former consultation “Five-year Spectrum Outlook 2023–28”, recommended to ACMA to initiate proceedings to authorization of Standard Power (SP) mode under supervision of an Automated Frequency Coordination (AFC) System in the 6 GHz band¹⁵. SP mode enables Wi-Fi operation at higher power than both the Very Low Power (VLP) and Low Power Indoor (LPI) modes to optimally utilize the 6 GHz spectrum. As ACMA already authorized VLP and LPI modes in the 6 GHz band, IEEE 802 LMSC kindly requests ACMA to initiate the process to authorize SP mode and certification of AFC Devices (SP access points or fixed clients) and AFC Systems.

AFC technology is considered as the state-of-the-art mitigation technique to protect incumbent services for outdoor and indoor operation at SP level. In the consultation paper, ACMA refers to AFC as a potential mitigation technique to protect incumbent services for outdoor operation along with VLP mode but at higher power level¹⁶. IEEE 802 LMSC believes that an AFC System, as an effective automated spectrum sharing technology, is critical in enabling essential Wi-Fi technology applications and use cases not only for outdoor operation but also indoor operation at SP level.

Authorizing SP mode at a maximum EIRP of 36 dBm for access points and 30 dBm for client devices for indoor and outdoor operation enables many key applications including metaverse, multigigabit per second outdoor coverage (e.g., parks, stadiums), multi-gigabit point-to-multipoint connectivity, and low-latency applications including industrial IoT and Voice over IP (Wi-Fi calling). SP operation also improves indoor Wi-Fi performance to match coverage performance of the 5 GHz band.

[03/Outcomes%20Paper_Proposed%20updates%20to%20the%20LIPD%20Class%20Licence%20for%206%20GHz%20RLANs.pdf](#) [accessed: 18 April 2024]. (“We see strong arguments for the introduction of arrangements for RLANs across the entire 6 GHz band, and do not believe that waiting for the outcomes of WRC-23 agenda item 1.2 is itself a valid reason to defer a decision on the upper 6 GHz band (especially given that it is only considering 100 MHz from the band in our region).”)

¹¹ See Wi-Fi Alliance: Wi-Fi Alliance® introduces Wi-Fi CERTIFIED 7™, <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-introduces-wi-fi-certified-7> [accessed: 27 April 2024].

¹² See “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. With introduction of 320 MHz channel bandwidth, Wi-Fi 7 doubles throughputs relative to Wi-Fi 6E and significantly improves latency for Extended Reality (XR), bringing determinism through enablement of Multi-Link Operation (MLO) over multiple bands in 2.4 GHz, 5 GHz, and 6 GHz bands. Wi-Fi 7 also provides higher efficiency, relative to Wi-Fi 6E, through offering of 4096 QAM. In addition, spectrum puncturing improves flexibility in utilizing spectrally efficient wide channel bandwidth, e.g., 160 MHz and 320 MHz, while protecting incumbent operation in the band.

¹³ See Wi-Fi Alliance: Wi-Fi 7 market momentum: Wi-Fi 7 is here – is your network ready?, <https://www.wi-fi.org/beacon/chris-hinsz/wi-fi-7-market-momentum-wi-fi-7-is-here-is-your-network-ready> [accessed: 27 April 2024].

¹⁴ See pages 2 and 3 of the submission “Public - IEEE 802 LAN-MAN Standards Committee_Redacted.pdf”, <https://www.acma.gov.au/sites/default/files/2023-10/Submissions%20-%20IFC%2028-2023.zip> [accessed: 27 April 2024]. (“Authorize LIPD Class Licence operation in the entire 6 GHz band is beneficial to Australia.”)

¹⁵ See page 3 of the submission “Public - IEEE 802 LAN-MAN Standards Committee_Redacted.pdf”, <https://www.acma.gov.au/sites/default/files/2023-10/Submissions%20-%20IFC%2028-2023.zip> [accessed: 27 April 2024]. (“It is the right time to actively pursue Dynamic Spectrum Access arrangements, specifically AFC, in Australia”)

¹⁶ See page 62 of the consultation paper.

The USA and Canada have already authorized SP mode and started certification of AFC systems. The certification process for AFC systems and devices is based on the industry developed recommended compliance specifications^{17, 18}. On 21 August 2023, Innovation, Science and Economic Development Canada (ISED) approved¹⁹ an AFC System for operation in Canada. On 23 February 2024, Federal Communications Commission (FCC) announced²⁰ approval of seven AFC systems for commercial operation in the USA. A number of AFC devices and Fixed Client devices are already certified too. Many other countries, including Japan, Saudi Arabia, South Korea, and Brazil, are also studying enablement of SP mode.

As AFC devices are being certified and introduced in the market, Wi-Fi industry expects that the first significant deployments of SP mode to be indoor through upgrading of LPI access points to indoor SP access points, i.e., SP/LPI converged access points. These converged access points are targeting simultaneous support of LPI-only clients, SP clients, and dual LPI/SP clients in the same indoor network to improve overall system efficiency and spectrum utilization while protecting incumbent services.

In anticipation of deployment of indoor SP access points and to improve interoperability with various client device types, IEEE 802.11 recently updated its sets of supported regulatory capability signaling²¹ to distinguish indoor SP access point amongst other improvements and expansion in the regulatory signaling.

As indoor SP access points are operating indoor, they should be entitled to an additional Building Entry Loss (BEL) credit to be considered in AFC System's calculation of spectrum availability and maximum permissible transmit power. US FCC allows indoor SP operation and also considers BEL credit for such operation using waiver request. IEEE 802 LMSC recommends ACMA to consider maximum flexibility including those related to indoor SP mode in its future rulings for the 6 GHz band.

IEEE 802 LMSC noted the presence of different types of incumbent services, including Point-to-Point, Satellite Receive, Fixed Earth, and Radiodetermination, in Australia Register of Radiocommunications Licences database²². With proper consideration of protection criteria for the incumbent services, we believe that AFC Systems can properly implement the frequency coordination and maximum allowable power settings for AFC Devices. As an example, in US, AFC Systems determine frequency and channel availability and maximum permissible power levels for AFC Devices considering incumbent Fixed Services and Radio Astronomy Services as well as neighboring countries incumbent services at the borders.

¹⁷ See: Wi-Fi Alliance: 6 GHz AFC resources, Specifications, test plans, and training modules to enable implementation of the 6 GHz standard power devices under AFC system control. <https://www.wi-fi.org/discover-wi-fi/6-ghz-afc-resources> [accessed: 27 April 2024].

¹⁸ See Wireless Innovation Forum: Specifications, <https://6ghz.wirelessinnovation.org/baseline-standards> [accessed: 27 April 2024].

¹⁹ See Innovation, Science and Economic Development Canada: List of designated Dynamic Spectrum Access System Administrators (DSASAs), Automated Frequency Coordination System Administrators (AFCSAs), issue 1 of DBS-06, <https://ised-isde.canada.ca/site/certification-engineering-bureau/en/node/116> [accessed: 27 April 2024].

²⁰ See 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, <https://docs.fcc.gov/public/attachments/DA-24-166A1.pdf> [accessed: 27 April 2024].

²¹ See "IEEE Draft Standard for Information Technology -- Telecommunications and Information Exchange Between Systems Local and Metropolitan Area Networks -- Specific Requirements - Part 11: Wireless Local Area Network (LAN) Medium Access Control (MAC) and Physical Layer (PHY) Specifications," in IEEE P802.11-REVme/D5.0, February 2024, vol., no., pp.1-6203, 18 March 2024.

²² See ACMA: Register of Radiocommunications Licences, <https://web.acma.gov.au/rli/> [accessed: 27 April 2024].

Conclusion

IEEE 802 LMSC thanks ACMA for the opportunity to provide this submission and respectfully requests to consider our responses to:

- authorize LIPD Class Licence operation in the upper 6 GHz (6425 MHz – 7125MHz) band given Wi-Fi contribute significant societal, economic, and sustainability value to Australia;
- initiate authorization proceedings for standard power RLAN under supervision of AFC, and authorize standard power mode at a maximum EIRP of 36 dBm for access points and 30 dBm for client devices for indoor and outdoor operation

Respectfully submitted

By: /ss/.

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IEEE 802 LAN/MAN Standards Committee Chairman

