

Re: Consultation “Five-year spectrum outlook 2023–28 and 2023–24 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 2023–28 and 2023–24 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 focusing on the 6 GHz band.

IEEE 802 wireless technologies provide significant economic value to Australia

Significant economic value is provided by IEEE 802-based systems today. Wi-Fi technology, based on the IEEE 802.11 standard, has an estimated 18 billion devices in use world-wide, with over 4 billion devices added annually [1]. In addition, the list of Wi-Fi 6E [2] certified products (which are based on IEEE 802.11 technologies) is growing. In 2022, over 350 million Wi-Fi 6E devices entered the market [3]. As shown in an industry consortia report [4], Wi-Fi contributes \$34.7 billion in Australia’s economic value in 2021, and the economic value is expected to increase by 20% to \$41.7 billion by 2025.

Ultra-Wideband technology, which is specified by IEEE 802.15 standards, is finding adoption for numerous short-range sensing and ranging applications. IEEE Std 802.15.4-2020 [4] and IEEE Std 802.15.4z-2020 [5] are standards for precision ranging that are capable of using both the 6 GHz and 7 GHz frequency bands and are increasingly used in many high value applications. The capability of IEEE Std 802.15.4z-2020 to support secure ranging has led to a renewed interest in UWB from both industry and regulators. The automotive industry was the driving force behind

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.

IEEE Std 802.15.4z-2020 and the first to include UWB in consumer products. Mobile handset makers have followed closely. This is generating significant economic and social value, attracting further interest in developing future UWB standards.

2023–24 Annual Work Program: 6 GHz (5925–7125 MHz)

Authorize LIPD Class Licence operation in the entire 6 GHz band is beneficial to Australia

The IEEE Std 802.11ax-2021 standard [7] supports operation in the 2.4 GHz, 5 GHz, and 6 GHz bands, and products based on this standard are seeing significant adoption where regulatory rules permit deployment [2]. IEEE 802 technologies are designed to not cause interference with incumbent services in these bands. Based on IEEE Std 802.11ax-2021, the Wi-Fi industry is taking the lead in developing Wi-Fi 6E certification program and specifying a number of complementary coexistence strategies for bands with incumbent users, such as automated frequency coordination (AFC) [8] [9] for the 6 GHz band.

A new generation of IEEE 802.11 technologies, currently under development in the IEEE P802.11be amendment [10], will continue to improve performance and enhance spectrum coexistence capacities. To achieve the targeted performance improvements, IEEE P802.11be introduces advanced features including channel bandwidths of up to 320 MHz, multiple resource units to a single station, multi-link operation, enhanced quality of service (QoS), improved Target Wake Time (for improved battery life for IoT or other applications), and improved spectrum management to accommodate coexistence with incumbents more effectively and efficiently. Please note that the P802.11be amendment currently supports carrier frequency operation between 1 GHz and 7.125 GHz with extension to 7.250 GHz under consideration.

These IEEE P802.11be features are designed to meet increased performance requirements and the ever-increasing requirements of enterprise, commercial, and dense deployments when multiple simultaneous sessions of similar or different applications on multiple Wi-Fi networks are coexisting with incumbent service operation. To effectively allow IEEE P802.11be to meet these requirements, IEEE P802.11be's global 6 GHz channelization is designed to accommodate multiple 160 MHz and 320 MHz channels throughout the entire 6 GHz band, where available. ACMA's designation of 500 MHz of the 6 GHz band for RLAN use provides for only one 320 MHz channel, while the full 5925 MHz to 7125 MHz band would allow three such channels.

Deployment of new applications targeted by the IEEE 802.11ax-2021 standard and the upcoming IEEE 802.11be standard can be effectively scaled when multiple 320 MHz channels (as defined in IEEE P802.11be) are available. Many countries and regions including the USA, Canada, Brazil, South Korea, and Saudi Arabia have already allocated the entire 6 GHz band for license-exempt operation. Only recently, Colombia authorized license exempt operation in the entire 6 GHz band. Availability of the entire 6 GHz band for license-exempt use will create economies of scale and produce a robust equipment market, benefitting Australia's businesses, consumers, and economy, while providing societal benefits.

IEEE P802.15.4ab is developing the next generation of UWB standard based on industry needs to fuel the next round of innovative products. The project is built on IEEE Std 802.15.4z-2020 which are capable of using both the 6 GHz and 7 GHz frequency bands and has been widely implemented and is supported by a rich ecosystem of industry alliances, silicon vendors and product developers. New developments supported by the project include features to improve link budget and/or reduce

air-time, sensing capabilities to support presence detection and environment mapping, improved accuracy, precision and reliability for high-integrity ranging, interference mitigation techniques to support greater device density and higher traffic use cases and provide improved coexistence in the presence of other services in support of different regulatory regions, additional means to reduce complexity and power consumption, enhance support for ultra low energy, low latency streaming, while ensuring compatibility with the deployed base of products based upon IEEE Std 802.15.4z-2020. In addition, the project is built on the IEEE Std 802.15.4-2020 standard that supports peer-to-peer, peer-to-multi-peer, and station-to-infrastructure topologies and includes enhanced infrastructure synchronization mechanisms.

As recognized in the ACMA's paper "Proposed updates to the LIPD Class Licence for 6 GHz RLANs Outcomes paper" published in March 2022, there is a strong argument for the introduction of arrangements for RLANs across the entire 6 GHz band and there are no good reasons to defer a decision on the upper 6 GHz band. IEEE 802 LMSC recommends that ACMA authorizes LIPD Class Licence operation in the entire 6 GHz band.

It is the right time to actively pursue Dynamic Spectrum Access arrangements, specifically AFC, in Australia

Regarding authorized modes of operation in the 6 GHz band, IEEE 802 LMSC supports authorization of the VLP (very low power) and LPI (low power indoor) modes in the 6 GHz band by ACMA and kindly requests ACMA to actively pursue enablement of other modes of operation in the 6 GHz band. In addition to VLP and LPI modes, IEEE 802.11 technology supports Standard Power (SP) mode (under supervision of an AFC System) in the complying devices, through protocol level regulatory messaging.

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

Authorizing SP mode at a max EIRP of 36 dBm for access points and 30 dBm for client devices for indoor and outdoor operation enables many key applications including multigigabit per second outdoor coverage (e.g., parks, stadiums), multigigabit point-to-multipoint connectivity, low-latency applications including industrial IoT and Voice over IP (Wi-Fi calling) applications, and next-generation experiences with AR/VR/XR for indoor and outdoor. The USA, Canada, and Brazil have already authorized SP mode and are currently developing certification process for AFC systems. Many other countries including Saudi Arabia, South Korea, and Japan are studying enablement of SP mode. Recommended compliance specifications are also being developed by industry stakeholders [11] [12] for consideration by the US FCC for its AFC system and device certification program.

To build on capabilities and use cases supported by already authorized VLP and LPI modes and to fully utilize the potential of the 6 GHz spectrum, IEEE 802 LMSC recommends ACMA authorizes Standard Power mode under supervision of an AFC system.

Conclusion

IEEE 802 LMSC thanks the ACMA for the opportunity to provide this submission and kindly requests ACMA to consider our responses in its future decisions regarding the LIPD Class Licence of 6 GHz band for RLAN use and authorization of Standard Power mode under AFC supervision.

Respectfully submitted

By: /ss/.

Paul Nikolich

IEEE 802 LAN/MAN Standards Committee Chairman

em: p.nikolich@ieee.org

References:

- [1] Wi-Fi Alliance: Value of Wi-Fi. [Available online](#) [accessed: 16 April 2023]
- [2] Wi-Fi Alliance: Wi-Fi 6E momentum underscores need for entire 6 GHz band, November 2022. [Available online](#) [accessed: 16 April 2023].
- [3] Wi-Fi Alliance: Wi-Fi 6E certified products. [Available online](#) [accessed: 16 April 2023]
- [4] Wi-Fi Alliance: Global Value of Wi-Fi. [Available online](#) [accessed: 16 April 2023]
- [5] "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/IEEESTD.2020.9144691.
- [6] "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/IEEESTD.2020.9179124.
- [7] "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.
- [8] Dynamic frequency coalition: Automated frequency coordination - an established tool for modern spectrum management, March 2019. [Available online](#) [accessed: 16 April 2023].
- [9] Intel: Spectrum sharing using automated frequency coordination. [Available online](#) [accessed: 16 April 2023]
- [10] 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/D3.0, January 2023 , vol., no., pp.1-999, 1 March 2023.
- [11] Wi-Fi Alliance: AFC Specification and Test Plans. [Available online](#) [accessed: 16 April 2023]
- [12] Wireless Innovation Forum: Specifications. [Available online](#) [accessed: 16 April 2023]