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May 6, 2024

VIA ELECTRONIC FILING AT Online submissions

The Manager
Spectrum Licensing Policy Section
Australian Communications and Media Authority
PO Box 13112 Law Courts
Melbourne VIC 8010

Re: **FIVE YEAR SPECTRUM OUTLOOK 2024-29 AND 2024-25 WORK PROGRAM– DRAFT FOR CONSULTATION**

Dear Colleagues,

Wi-Fi Alliance commends the Australian Communications and Media Authority (the "ACMA") on its ongoing work in the area of spectrum management. The Five Year Spectrum Outlook for 2024-2029 and 2024-25 Work Program ("*Spectrum Outlook*")[1/] remains a critical tool to update the public of the areas in which the ACMA expects to focus and to solicit feedback that will provide the ACMA with the information necessary to proceed. In the *Spectrum Outlook*, the ACMA astutely recognized that Wi-Fi has become indispensable to delivering wireless connectivity to consumers and enterprises in Australia.[2/] Wi-Fi devices are now the primary means by which Australians connect to the Internet. This central role continuous to grow with Wi-Fi established as an essential complement to Fifth Generation wireless ("5G") networks.[3/] It is also important to consider that connectivity provided by Wi-Fi through low-cost, Low Interference Potential Devices (LIPD) class license delivers billions of dollars in value to the Australia's economy. Indeed, a study by Telecom Advisory Services found that class-licensed networks like Wi-Fi generated over 35 billion dollars in value to the Australia's economy in 2021, a number expected to grow to 42 billion dollars by 2025.[4/]

1/ *Five Year Spectrum Outlook 2024-29 and 2024-25 Work Program*, *Draft for Consultation*, March 2024 ("Spectrum Outlook") available at Draft Five-year spectrum outlook 2024–29 | ACMA

2/ *Spectrum Outlook* at 18

3/ *Spectrum Outlook* at footnote 17

4/ *Economic Value of Wi-Fi available at* http://valueofwifi.com

I. Options for the 6425-7125 MHz band.

In considering the "next steps" on the 6425-7125 MHz band ("upper-6 GHz band"), primarily the question of RLAN or IMT use of the band,[5] Wi-Fi Alliance respectfully asks the ACMA to consider the following points:

(1) The latest generation of Wi-Fi (i.e., Wi-Fi 7) is now available and ready to support emerging applications that require high levels of interactivity and reliability. In the meantime, the 6 GHz IMT will not be commercially available for several years, if at all.

Wi-Fi 7 implements powerful new features, summarized below, that boost performance and improve connectivity across consumer and commercial market segments with cutting-edge capabilities that deliver high throughput, deterministic latency, and greater reliability.

- 320 MHz channels: Doubles today's widest channel size to facilitate multi-gigabit device speeds and high throughput.
- Multi-Link Operation (MLO): Allows devices to transmit and receive data over multiple links for increased throughput and improved reliability.
- 4K QAM: Achieves 20% higher transmission rates than 1024 QAM.
- 512 Compressed Block Ack: Improves efficiency and reduces overhead.
- Multiple RUs to a single STA: Improves flexibility for spectrum resource scheduling to enhance spectrum efficiency.
- Triggered Uplink Access: Optimizes Wi-Fi 6 defined triggered uplink access to accommodate latency sensitive streams and satisfy QoS requirements.
- Emergency Preparedness Communication Services (EPCS): Provides a seamless National Security & Emergency Preparedness (NSEP) service experience to users while maintaining the priority and quality of service in Wi-Fi access networks.

With these features, Wi-Fi 7 provides an unprecedent performance which is necessary for enablement of the innovative use cases including multi-user AR/VR/XR, immersive 3-D training, electronic gaming, hybrid work, industrial automation, and many others.

As the 6 GHz regulatory landscape evolves, Wi-Fi 7 devices are quickly becoming available in several countries. In 2024, over 269 million Wi-Fi 7 devices will be introduced into the market. And by 2028, the annual shipments of the 6 GHz enabled Wi-Fi devices are projected to exceed 2.5 billion. In short, regulatory harmonization in the 6 GHz band will create economies of scope and scale and produce a robust equipment market, benefitting Australian businesses, consumers, and the economy. But these benefits cannot be fully realized without Wi-Fi access to adequate spectrum capacity. Access to less than the entire 6 GHz band (i.e., lower- and upper-6 GHz bands) substantively reduces Wi-Fi 6E and Wi-Fi 7 performance in terms of latency and data throughput. The 5925-6425 MHz band (i.e., 500 MHz) does not offer sufficient spectrum capacity to support the highest Wi-Fi 7 performance.

[5] *Spectrum Outlook* at 43.

(2) Wi-Fi access to the 6.425-7.125 GHz is needed to support the Gigabit connectivity and there are no alternative frequency bands that may address growing demand for Wi-Fi bandwidth now or in the future.

A recently completed study analyzed the impact of spectrum availability on Wi-Fi ability to support gigabit connectivity in residential deployments.[6] The simulation modeled high-density Wi-Fi deployments in a typical residential apartment building with Gigabit fibre connectivity to every apartment. The model was set to ensure that Wi-Fi spectrum congestion does not constrain (i.e., bottleneck) the gigabit connectivity. Results of this study confirm that Wi-Fi access to only the 5925-6425 MHz band ("lower 6 GHz band") substantially impairs gigabit connectivity. Specifically, this study confirms that the five 160 MHz channels (two 160 MHz channels in 5 GHz frequency range and three 160 MHz channels in the lower-6 GHz band can only support gigabit coverage to approximately 50-60% of residential building areas. To ensure whole-building coverage, a minimum of ten channels is necessary. In Australis, the Wi-Fi spectrum shortage is further exacerbated because there are no arrangements in place for RLANs in the 5850– 5925 MHz band.

Wi-Fi Alliance asks the ACMA to note that optimal Wi-Fi performance depends on access to multiple wider (e.g., 160 MHz and 320 MHz) channels in the 6 GHz band– without Wi-Fi access to 6425-7125 MHz, Australian consumers and enterprises will not realize the full benefits of Wi-Fi 6E, Wi-Fi 7 and future generations of Wi-Fi technologies. And, importantly, potential degradation in Wi-Fi performance will undermine Australia's gigabit infrastructure investments and benefits. [7]

(3) IMT/cellular requirements in the upper-6 GHz are questionable.

The spectrum needs of IMT networks are questionable at best, particularly in light of recent decisions on the 700 MHz, 3.5 GHz, 26/28 GHz and other frequency bands. Thus, the IMT proponents' assertions on the need for identification in yet another frequency band (i.e., 6425-7125 MHz) are simply irrational. Moreover, with the WRC-27 agenda item 1.7, the IMT proponents already moved on to other "mid-band spectrum" in the 4.4-4.8 GHz, 7.125-8.4 GHz and 14.8-15.35 GHz bands.[8] Given that purported IMT spectrum needs can be accommodated in a variety of other frequency bands, while Wi-Fi is specifically engineered for the 6 GHz band, Wi-Fi Alliance respectfully asks the ACMA to consider that the 6425-7125 MHz is the only mid-band spectrum that can support rapidly growing need for Wi-Fi connectivity in Australia. Without access to the upper-6 GHz band, Wi-Fi capabilities in Australia will be permanently impaired, undermining the overall connectivity goals and objectives.

***(4)* Cost-benefit implications of IMT designation in the 6425-7125 MHz frequency band.**

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6 *Wi-Fi Spectrum Requirements*, Plum Consulting, March 2024

7 Australia's National Broadband Network - $51 billion project that aims to provide high-speed to homes, schools, and workplaces.

8 See Resolution 256 (WRC-23) available at https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A0000100007PDFE.pdf

(a) IMT networks cannot coexist with incumbent high-capacity fixed microwave networks in the 6425-7125 MHz frequency band because the IMT deployments require priority access to spectrum and, therefore, IMT networks cannot avoid interfering with or tolerate interference from the incumbent operations. A decision to permit IMT operations in the 6425-7125 MHz frequency band will result in unavoidable relocation of the 6 GHz fixed microwave networks to another frequency band. But even if an alternative frequency band is made available, such a relocation will entail significant costs and extensive transition periods (i.e., years).

(b) Many countries have already decided that the 6425-7125 MHz frequency band is not suitable for IMT implementation. Sporadic IMT deployments only in some countries is contrary to the very premise of spectrum harmonization (intended goal of the IMT identification), negating potential harmonization benefits.

(c) The 6425-7125 MHz frequency band is extensively used by the Fixed Satellite Service (FSS) uplinks in many countries. All administrations are obligated by the international treaty to protect on-orbit FSS satellite receivers from interference that may be caused by the IMT network(s) base stations on their territories. Resolution 220 (WRC-23) prescribes a complex regulatory regime to control e.i.r.p. spectral density emitted by IMT base stations for the protection of the FSS (Earth-to-space) link. Allowing IMT deployments in the 6425-7125 MHz band will burden the ACMA with perpetual obligation to manage the IMT networks' compliance with this obligation and engage in multilateral interference resolution proceeses.

(d) Signal path loss (i.e., reduction in signal strength as the waves propagate) increases with frequency. Also, higher frequency signals have more difficulty penetrating buildings and other structures, which can result in poor indoor coverage. That is why 6425-7125 MHz is less suitable for IMT deployments than lower frequency bands (e.g., 3.5 GHz). Additional expenditures required to overcome the 6425-7125 MHz band characteristics (e.g., network densification) will impact the 6 GHz IMT networks commercial viability, possibly rendering them unfeasible.

(e) Significant time (i.e., years) and investments (i.e., billions of dollars) will be required to develop, implement, deploy, and operate IMT networks in the 6425-7125 MHz band. It is unlikely that such IMT networks will be commercially viable, given their limited market scale and harmonization. These IMT implementations simply lack the economies of scope and scale necessary for a robust equipment ecosystem or commercial viability. In the meantime, the latest Wi-Fi technology, operating in the 6 GHz band, is already on the market, empowering tremendous connectivity benefits which are ready to be provided to Australia's businesses, consumers, and the economy.

II. Arrangements for frequency-hopping spread spectrum devices in the 5 GHz and lower 6 GHz bands.

Wi-Fi Alliance notes the ACMA's plans to consider arrangements for frequency-hopping spread spectrum devices in the 5 GHz and lower 6 GHz bands.[9/] In this regard, Wi-Fi Alliance asks the ACMA to consider that contention-based protocols such as Wi-Fi's carrier sense multiple access with collision avoidance (e.g., Listen Before Talk), enable co-existence of multiple LIPD technologies. Importantly, the same contention-based protocols used by the LIPDs to ensure that they do not interfere with one another, reduce interference potential to incumbent operations in the 6 GHz band. The IEEE specification for Wi-Fi, for example, requires energy detection at -62 dBm/20 MHz. Wi-Fi Alliance members report that their implementation can sense at an even lower threshold to ensure compliance with the IEEE specification. So, in real world implementations, the contention-based protocol is even more effective in protecting incumbent operations and ensuring coexistence.

In light of the above, Wi-Fi Alliance respectfully asks the ACMA to establish an appropriate spectrum access mechanism and to prioritize fair coexistence among various LIPD technologies in the 5 GHz and 6 GHz bands. Fairness in spectrum access for all LIPD technologies is paramount – otherwise, the Wi-Fi, spread spectrum and other technologies operating in the 5 GHz and 6 GHz bands risk a race to the bottom, in which unlicensed spectrum becomes potentially unusable in many scenarios.

III. Introduction of standard power RLANs in the 6 GHz bands

Wi-Fi Alliance commends ACMA's plans to consider regulatory arrangements that would allow operation of standard power RLANs under control of the Automatic Frequency Coordination (AFC) system in the 6 GHz band.[10/] The AFC system approach maximizes spectrum availability for the LIPD devices, such as Wi-Fi 7, by dynamically determining channel availability to avoid and protect other operations in the 6 GHz frequency band. Wi-Fi Alliance is leading development of specifications, test plans, and training modules to support the 6 GHz AFC implementations (see 6 GHz AFC Resources). Already, these resources facilitated authorization of the AFC system operations in Canada[11/] and the United States[12/]. Wi-Fi Alliance is committed and ready to support ACMA's efforts to expand Wi-Fi connectivity benefits in Australia.

IV. Conclusion

Policymakers worldwide recognize that wireless connectivity is increasingly dependent on Wi-Fi. And the *Spectrum Outlook* represents an important step toward making much-needed

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9/ *Spectrum Outlook* at 59

10/ *Spectrum Outlook* at 62

11/ See ISED Canada, List of Designated Spectrum Access System Administrators available at https://ised-isde.canada.ca/site/certification-engineering-bureau/en/node/116

12/ See FCC Public Notice, 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, DA 24-166, ET Docket No. 21-352 (rel. Feb. 23, 2024) available at: https://docs.fcc.gov/public/attachments/DA-24-166A1.pdf

spectrum available to address growing demand for Wi-Fi connectivity in Australia. Wi-Fi Alliance appreciates the opportunity to contribute to ACMA's spectrum management efforts.

Respectfully submitted,

/s/ Alex Roytblat

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