September 27, 2019

**Via Electronic Filing**

The Manager

Spectrum Planning and Engineering Branch

Australian Communications and Media Authority

PO Box 78

Belconnen ACT 2616

Australia

Re: New Approaches to Spectrum Sharing - Information Paper

Dear Sir or Madam,

Wi-Fi Alliance®[[1]](#footnote-1)/ commends the Australian Communications and Media Authority (the “ACMA”) on its ongoing work in the area of spectrum management. The New Approaches to Spectrum Sharing – *Consultation* [[2]](#footnote-2)/ is a helpful tool for the ACMA to consider new and innovative spectrum management approaches. In this regard, Wi-Fi Alliance, encourages the ACMA to note ongoing US and European efforts to expand license-exempt spectrum access and to consider similar approaches in its future regulatory efforts..

1. **Introduction and Background**

Wi-Fi Alliance is a global, non-profit industry association of over 800 leading companies from dozens of countries devoted to seamless interoperability. With technology development, market building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi® worldwide, certifying thousands of Wi-Fi products each year.

RLANs using Wi-Fi standards have become increasingly important in connecting people and devices. With over 800 million household installations and 340 million Wi-Fi hotspots around the world, Wi-Fi is the primary on-ramp to the Internet -- providing access in homes and businesses, and on the go, with hotspots on planes, trains, and in cars, as well as in coffee shops, restaurants, and hotels.[[3]](#footnote-3)/ Devices using spectrum that supports Wi-Fi are now the primary means by which Australia connects to the Internet.[[4]](#footnote-4)/ The importance of Wi-Fi to consumers and businesses will continue to grow with increased demand for ubiquitous connectivity. The amount of traffic offloaded to Wi-Fi from cellular networks, for example, has increased with each generation of cellular technology (2G, 3G, and 4G). [[5]](#footnote-5)/ This trend is expected to continue but at an even greater rate with 5G data-intensive applications spurring the demand for Wi-Fi capacity. Wi-Fi will be essential to extending carrier 5G networks’ coverage and enabling ubiquitous broadband, low-latency connections.[[6]](#footnote-6)/ Wi-Fi is a “key enabler” of carrier 5G networks,[[7]](#footnote-7)/ since those 5G networks cannot, on their own, fulfil the promise of ubiquitous broadband coverage.[[8]](#footnote-8)/

All of this traffic over Wi-Fi-enabled and other RLAN devicesrequiresspectrum, as the ACMA recognized in its 2017 Spectrum Outlook,[[9]](#footnote-9)/ but additional work is necessary to make more spectrum available for these operations as they have grown in number and carry more and more traffic.[[10]](#footnote-10)/

A recently produced analysis of the economic value of Wi-Fi concluded that the annual Wi-Fi contribution to the global economy is almost USD $2 trillion today, and will nearly double by 2023.[[11]](#footnote-11)/ The report found that Wi-Fi is an “enabling resource” which extends connectivity to underserved areas, allows other innovative products and services to develop and thrive (including portable devices that require Internet access but lack cellular connection), expands access to communications services and increases the value of those offerings (such as by spreading a wireline connection throughout the home and through off-loading to reduce the strain on cellular networks), and enhances the effectiveness of existing product and service offerings (such as “smart home” devices).

Wi-Fi Alliance, therefore, submits its comments in response to the *Consultation* to urge the ACMA to further expand the use of shared spectrum in Australia and to designate more spectrum available for class licensed RLANs including those using Wi-Fi protocols.

1. **Answers to Questions**

***Consultation Question #1: Given current momentum in international markets and opportunities for other sharing models offered by 5G technologies, is it timely to develop a more detailed consideration of spectrum sharing opportunities in Australia?***

*Answer*: Yes, ACMA should consider additional spectrum sharing opportunities, particularly for class-licensed access technologies such as Wi-Fi. Projected demand for broadband wireless connectivity, necessitates exploring new, more flexible spectrum management and utilization approaches. Wi-Fi continues to be a critical component of wireless broadband infrastructure and is a critical driver of the economic growth:[[12]](#footnote-12)/ it is the predominant on- and off-ramp for Internet access from homes and businesses; it supports a significant portion of wireless carrier’s network traffic through offload; and it is, and will be, an important part of the Internet of Things (“IoT”) architecture.[[13]](#footnote-13)/ The evolution of Wi-Fi from a nascent technology to a critical component of broadband wireless connectivity infrastructure, however, has not been met by a corresponding increase in spectrum access, despite the widely recognized need to provide more spectrum to satisfy Wi-Fi spectrum needs.[[14]](#footnote-14)/ In addition to the spectrum congestion issues, next generation Wi-Fi (Wi-Fi 6) which is intended to support high-bandwidth applications (e.g., high-definition video streaming, virtual reality) is optimized for channel bandwidths of 80 megahertz and 160 megahertz, far larger than the 20 megahertz channels used in the 2.4 GHz band.[[15]](#footnote-15)/ Recognizing this issue, other regulatory authorities, including those in the United States,[[16]](#footnote-16)/ the EU,[[17]](#footnote-17)/ and Singapore,[[18]](#footnote-18)/are considering expanded license-exempt access to the 5925-7125 MHz band (“6 GHz band’).

Considering the above, Wi-Fi Alliance recommends that ACMA initiate consideration towards allowing the Low Interference Potential Devices (LIPDs) access to the 6 GHz band.

***Consultation Question # 2: Are there recent developments in sharing techniques that industry and the ACMA should be aware of?***

*Answer*: In considering shared spectrum access for class-licensed devices, the ACMA should note advanced research on the building entry loss (“BEL”). Considering that class-licensed device deployments can be effectively restricted to indoor-only deployments, the BEL is an important factor to consider in spectrum sharing. The building entry loss (“BEL”) value of high-rise buildings (*i.e.*, 40 meters above ground level – about 12 stories) is significantly higher than average: 18 dB for “traditional” construction in contrast to 30 dB for these “thermally efficient” buildings. Building codes that are widely applied to taller, modern buildings mandate energy efficiency – which in turn provides for higher BEL values resulting in greater signal attenuation and lower risk of interference. In addition to the ITU models[[19]](#footnote-19), a comprehensive study produced by Ofcom[[20]](#footnote-20)/ confirms BEL values for a variety of building materials. In particular, according to the Ofcom study, the losses from foil-backed insulation and metalized double glazed windows, such as those found in modern office buildings, would exceed 30 dB.[[21]](#footnote-21)/ The studies show that low e-glass, double-glazed, energy saving windows that are primarily used in taller, modern buildings shield the signal at 6 GHz an average of 30 dB.

Another factor that can significantly augment shared spectrum access for class-licensed device is application of appropriate propagation models. In this regard, first, it is important to recognize that a free space path loss model effectively assumes worst case conditions and, therefore, overestimate the potential interference and unnecessarily restricts access to spectrum. In considering spectrum sharing by class-licensed devices, a combination of a short-range propagation model based on WINNER II and a beyond-line-of-sight model derived from the Irregular Terrain Model and ITU-R P.2108 models are best suited for the purpose. In particular, the WINNER II model covers most relevant propagation scenarios including a variety of indoor locations, indoor hot-spots, typical urban micro-cells, typical urban macro-cells, sub-urban macro-cells, rural macro-cells, and line-of-sight urban macro-cells.[[22]](#footnote-22)/

Varying class-licensed use cases require spectrum capacity in different bands. To address this requirement, while minimizing impact on the existing operations, ACMA should consider geo-location database solutions to manage frequency access on secondary basis. In general, the applications of such solutions are premised on computing frequency availability at specified incumbent receiver location taking into account its characteristics (e.g., pointing direction, antenna gain pattern, etc.) and the class-licensed transmitter power along with its antenna location and direction, and the overall propagation environment. The ACMA must take care so as not to preclude commercial viability of the geo-location database solutions. In particular, the AMCA regulation should focus on functional and avoid prescribing specific design or implementation.

***Consultation Question #3:* What are the (potentially new) use cases that might benefit from secondary or tertiary access to spectrum and who benefits?**

*Answer*: Although Wi-Fi is the most universally accepted unlicensed application, the lack of spectrum access threatens its ability to continue to deliver significant socioeconomic benefits and foster innovation. Wi-Fi Alliance commissioned a Spectrum Needs Study that highlights the requirements for additional unlicensed spectrum. Given projected Wi-Fi traffic growth by 2025, up to 1500 megahertz of additional mid-band spectrum may be needed. The Spectrum Needs Study also demonstrates the need for contiguous spectrum blocks to accommodate 160 megahertz channels which are desirable for high-bandwidth applications, such as video and virtual reality, supported by the next generation Wi-Fi 6 that are specifically intended to support high-data throughput connectivity. In short, rapidly growing demand for broadband wireless connectivity delivered by Wi-Fi to consumers and enterprises is outpacing available spectrum capacity. Only urgent regulatory action can prevent this looming spectrum crunch from degrading the socioeconomic benefits delivered by Wi-Fi. Wi-Fi Alliance, therefore, urges the ACMA to move forward on making the much needed 5925-7125 MHz spectrum available for Wi-Fi access.

As a class-licensed access technology, Wi-Fi operates on non-interference basis and has a long history of implementing innovative spectrum sharing solutions to protect other users – both licensed and unlicensed – and can replicate that success in the 6 GHz band. Regulatory solutions that have been mandated in the 5 GHz bands, including indoor-only restrictions, transmit power limits, antenna gain masks, and other operational constraints can be adopted for Wi-Fi operations in the 6 GHz band. Importantly, ongoing efforts in Europe and US, are converging on the spectrum sharing framework that will significantly expand 6 GHz spectrum utilization while protecting incumbent services. The basis for this framework is a three device classes approach:

* Very Low Power (less than 25 mW conducted power) devices address short-range, high-bandwidth scenarios like 5G gigabit mobile tethering (including automotive use cases) that exist today, as well as new “last meter” apps like AR/VR, IoT, direct peer-to-peer
* Low Power (less than 250 mW conducted power) Indoor-only devices address the bulk of the consumer segment, which are deployed singly or very small groups, exclusively indoors
* Standard Power (less than 1W conducted power) devices that operate only on frequencies determined to be acceptable at a specified geographical location.

Wi-Fi Alliance recommends that the ACMA consider similar regulatory framework for the class-licensed devices enabling broadband connectivity for the Australian consumers and business while preserving existing operations in the 6 GHz band.

***Consultation Question #4:* Facilitating spectrum access (e.g. monitoring, control, reporting, assignment) logically necessitates involvement from both government and industry. Are there any early thoughts on what an appropriate industry/government balance might look like? How might the ACMA facilitate shared spectrum access? How might the ACMA address this?**

*Answer*: Spectrum is a limited natural resource. Increased spectrum access (i.e., maximizing utilization of this resource) is clearly in the interest of the Australian consumers and enterprises. Increased spectrum access, however, requires taking in to account and avoiding interference to the existing spectrum users and that, in turn requires extensive understanding of the currently deployed systems and networks. As the national spectrum regulator, the ACMA is the primary source of information for data on the existing licensees including transmitter and receiver locations, frequencies, bandwidths, polarizations, transmitter EIRP, antenna height, and the make and model of the antenna and equipment used, etc. Facilitating access to the licensing data would enable development of innovative spectrum access techniques that would protect incumbent operations, increase spectrum utilization and, most importantly, the overall public benefit.

1. **Conclusions**

The future of the Internet is more: more traffic, more devices, more uses. RLANs that use Wi-Fi protocols will be at the center of this growth. It is therefore crucial that the ACMA ensure that Australians can make the most of that future by dedicating additional spectrum for these operations.

Respectfully submitted,

*/s/ Alex Roytblat*

**Wi-Fi Alliance**

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1. / Wi-Fi®, the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access® (WPA), WiGig®, the Wi-Fi Protected Setup logo, Wi-Fi Direct®, Wi-Fi Alliance®, WMM®, Miracast®, and Wi-Fi CERTIFIED Passpoint® , and Passpoint® are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED™, Wi-Fi Protected Setup™, Wi-Fi Multimedia™, WPA2™, Wi-Fi CERTIFIED Miracast™, Wi-Fi ZONE™, the Wi-Fi ZONE logo, Wi-Fi Aware™, Wi-Fi CERTIFIED HaLow™, Wi-Fi HaLow™, Wi-Fi CERTIFIED WiGig™, Wi-Fi CERTIFIED Vantage™, Wi-Fi Vantage™, Wi-Fi CERTIFIED TimeSync™, Wi-Fi TimeSync™, Wi-Fi CERTIFIED Location™, Wi-Fi CERTIFIED Home Design™, Wi-Fi CERTIFIED Agile Multiband™, Wi-Fi CERTIFIED Optimized Connectivity™, and the Wi-Fi Alliance logo are trademarks of Wi-Fi Alliance. [↑](#footnote-ref-1)
2. / New Approaches to Spectrum Sharing - Information Paper, August. 2019, available at <https://www.acma.gov.au/theACMA/-/media/3E62C6D4613B4872960A36934F00BA44.ashx> . [↑](#footnote-ref-2)
3. / Telecom Advisory Services, The Economic Value of Wi-Fi: A Global View (2018 and 2023), at 10, rel. Oct. 2018, available at <https://www.wi-fi.org/value-of-wi-fi> (“*Economic Value of Wi-Fi*”). The report noted that Wi-Fi is a “key enabler” of forthcoming 5G mobile networks, and incorporated many of those benefits into its analysis. [↑](#footnote-ref-3)
4. / CISCO, *VNI Complete Forecast Highlights Tool*, Asia Pacific, Australia, Wired Wi-Fi and Mobile Growth (2016), available at <http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html> (select “Australia” from the “Asia Pacific” drop-down menu and expand “Fixed/Wi-Fi.” (“CISCO VNI”) [↑](#footnote-ref-4)
5. / *See*, *e.g.* Fierce Wireless, *Cellular and Wi-Fi Use – by operator and data plan type*, Mar. 21, 2018 (available at <https://www.fiercewireless.com/wireless/cellular-and-wi-fi-use-by-operator-and-data-plan-type-for-verizon-at-t-t-mobile-and-1>) (showing that over 75% of overall smartphone data travels over Wi-Fi, rather than commercial wireless, networks). [↑](#footnote-ref-5)
6. / *See e.g.* Brian Santo, *Wi-Fi vs. 5G? Nope, it’s both*, EDN Network, Dec. 5, 2017 (available at <https://www.edn.com/electronics-blogs/5g-waves/4459120/Wi-Fi-versus-5G--Nope--it-s-both>). [↑](#footnote-ref-6)
7. / *Economic Value of Wi-Fi*. [↑](#footnote-ref-7)
8. / Like 5G, Wi-Fi works across spectrum bands, taking advantage of different standards and propagation characteristics to provide the right performance for the required use case. Despite the increased capacity of wireless carriers, the demands that a 5G economy will place on commercial wireless networks will make offloading of traffic onto Wi-Fi even more crucial in the future, especially as Wi-Fi 6 promises speeds and performance that rivals or exceeds those of 5G networks. *See e.g.* Jacob Kastrenaks, *Qualcomm’s new Wi-Fi Chips are meant to rival 5G speeds*, THE VERGE, Oct. 16, 2018 (available at <https://www.theverge.com/circuitbreaker/2018/10/16/17980124/80211ay-wigig-qualcomm-wifi-10-gigabit-speeds>). [↑](#footnote-ref-8)
9. / *Five Year Spectrum Outlook 2017-21, The ACMA’s spectrum management work program*, Oct. 2017, at 57 (Table 7), available at <https://www.acma.gov.au/Home/theACMA/five-year-spectrum-outlook-2017-21>. Wi-Fi Alliance filed comments in response to this consultation on Jan. 24, 2018, available at <https://www.acma.gov.au/-/media/Spectrum-Review-Implementation-Taskforce/Issue-for-comment/IFC-27-2017/WFA-docx.docx>. [↑](#footnote-ref-9)
10. / For example, last year, despite Wi-Fi Alliance’s recommendations to the contrary, the ACMA declined to make available 50 megahertz more spectrum in the 5 GHz band (5150-5850 MHz). *See*, *Future use of the 3.6 GHz band – Decisions and preliminary views*, Oct. 2017, available at <https://www.acma.gov.au/Home/theACMA/~/-/media/9172FB58ADDA421A8137219272D5734B.ashx>. *See also*, Letter of Wi-Fi Alliance re: Future Use of the 3.6 GHz Band, Dec. 18, 2017. [↑](#footnote-ref-10)
11. / *Economic Value of Wi-Fi*. [↑](#footnote-ref-11)
12. / Telecom Advisory Services, The Economic Value of Wi-Fi: A Global View (2018 and 2023), at 10, rel. Oct. 2018, available at <https://www.wi-fi.org/value-of-wi-fi> (“*Economic Value of Wi-Fi*”). The report noted that Wi-Fi is a “key enabler” of forthcoming 5G mobile networks, and incorporated many of those benefits into its analysis. [↑](#footnote-ref-12)
13. / CISCO, *VNI Complete Forecast Highlights Tool*, Asia Pacific, Australia, Wired Wi-Fi and Mobile Growth (2016), available at <http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html> (select “Australia” from the “Asia Pacific” drop-down menu and expand “Fixed/Wi-Fi.” (“CISCO VNI”) [↑](#footnote-ref-13)
14. / *See e.g.* Brian Santo, *Wi-Fi vs. 5G? Nope, it’s both*, EDN Network, Dec. 5, 2017 (available at <https://www.edn.com/electronics-blogs/5g-waves/4459120/Wi-Fi-versus-5G--Nope--it-s-both>). [↑](#footnote-ref-14)
15. / Like 5G, Wi-Fi works across spectrum bands, taking advantage of different standards and propagation characteristics to provide the right performance for the required use case. Despite the increased capacity of wireless carriers, the demands that a 5G economy will place on commercial wireless networks will make offloading of traffic onto Wi-Fi even more crucial in the future, especially as Wi-Fi 6 promises speeds and performance that rivals or exceeds those of 5G networks. *See e.g.* Jacob Kastrenaks, *Qualcomm’s new Wi-Fi Chips are meant to rival 5G speeds*, THE VERGE, Oct. 16, 2018 (available at <https://www.theverge.com/circuitbreaker/2018/10/16/17980124/80211ay-wigig-qualcomm-wifi-10-gigabit-speeds>). [↑](#footnote-ref-15)
16. / *In the Matter of Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295, FCC 18-147 (rel. Oct. 24, 2018). [↑](#footnote-ref-16)
17. / European Commission, “Mandate to CEPT to study feasibility and identify harmonised technical conditions for Wireless Access Systems including Radio Local Area Networks in the 5925- 6425 MHz band for the provision of wireless broadband services” See: <https://cept.org/Documents/fm-57/41902/fm57-18-info002_european-commission-mandate-on-rlan-in-5925-6425-mhz> [↑](#footnote-ref-17)
18. / Infocomm Media Development Authority of Singapore, *5G Mobile Services and Networks,* Consultation Paper (May 23, 2017), available at <https://www.imda.gov.sg/regulations-licensing-and-consultations/consultations/consultation-papers/2017/public-consultation-on-5g-mobile-services-and-networks>. [↑](#footnote-ref-18)
19. ITU Recommendation P.2109 givers building entry losses for traditional building versus thermally efficient buildings for various incident angles. The Recommendation notes that the classification, of “thermally-efficient” and “traditional”, refers purely to the thermal efficiency of construction materials and makes no assumption regarding the year of construction, type (single or multi-floors), heritage or building method. ITU Recommendation P.2108 §3.2 gives a statistical clutter model loss for terrestrial based terminals and § 3.3 provides a statistical clutter model for Earth-space paths. [↑](#footnote-ref-19)
20. / *Ofcom*, *Building Materials and Propagation*, Final Report, Sept. 14, 2014, available at https://www.ofcom.org.uk/\_\_data/assets/pdf\_file/0016/84022/building\_materials\_and\_propagation.pdf (“*Ofcom Report*”). [↑](#footnote-ref-20)
21. / *Id.* at Section 4. While the *Ofcom Report* covers frequencies up to 5 GHz, the BEL factor would increase for frequencies in the 6-7 GHz range (see *Ofcom Report* Figure 4.4*)*. [↑](#footnote-ref-21)
22. / *See* IST-4-027756 WINNER II D1.1.2 V1.2, WINNER II Channel Models at https://www.cept.org/files/8339/winner2%20-%20final%20report.pdf. [↑](#footnote-ref-22)