10900-B Stonelake Boulevard, Suite 126 · Austin, Texas 78759 U.S.A.
Phone: +1-512-498-9434 (WIFI) · Fax: +1-512-498-9435
www.wi-fi.org

May 4, 2021

VIA ELECTRONIC FILING

The Manager
Spectrum Planning Section
Australian Communications and Media Authority
PO Box 78
Belconnen ACT 2616

Re: **Exploring RLAN use in the 5 GHz and 6 GHz bands – Discussion and Options Paper**

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 Discussion and Options Paper on Exploring RLAN Use in the 5GHz and 6 GHz Bands ("*Discussion Paper*")[1/] is a critical tool to inform 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. Wi-Fi Alliance applauds ACMA for recognizing essential role Wi-Fi technology plays in delivering wireless connectivity to consumers and enterprises in Australia.[2/] In light of that, Wi-Fi Alliance urges ACMA to ensure the future of Wi-Fi functionality by making much needed spectrum access available for the Low Interference Potential Devices (LIPD) class licence in the 5925–7125 MHz band. Also, Wi-Fi Alliance encourages ACMA to expand Wi-Fi access to the 5150-5250 MHz frequency band.

Introduction

Wi-Fi Alliance is a global, non-profit industry association of over 850 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. Radio Local Area Network systems (RLANs) using Wi-Fi standards have become increasingly important in connecting people and devices. Hundreds of millions of people rely on Wi-Fi to connect billions of devices every day, and studies show this is increasing rapidly.[3/] Devices using spectrum that supports Wi-Fi are now the primary means by which Australia connects to the Internet.[4/] This central role will only increase in the future, since Wi-Fi technology will be an essential complement to Fifth Generation wireless ("5G") networks, as highlighted by the recently released Cisco VNI Mobile Report

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1/ The ACMA's *Exploring RLAN use in the 5 GHz and 6 GHz bands - Discussion and Options Paper*, April 2020 ("*Discussion Paper*") available at: https://www.acma.gov.au/consultations/2021-04/rlan-use-5-ghz-and-6-ghz-bands-consultation-122021.

2/ *Discussion Paper* at 4.

3/ *See Wi-Fi Celebrates 20 Years with More Than 20 Billion Anticipated Device Shipments over the Next Six Years*, ABI Research (Jun. 13, 2019) available at: https://www.abiresearch.com/press/wi-fi-celebrates-20-years-more-20-billion-anticipated-device-shipments-over-next-six-years/

4/ CISCO, *VNI Complete Forecast Highlights Tool*, Asia Pacific, Australia, Wired Wi-Fi and Mobile Growth (2016), 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")

showing that traffic offloaded to Wi-Fi increase with each successive technology generation.[5/] All of this traffic over Wi-Fi-enabled devices requires spectrum. Wi-Fi Alliance's previously released *Spectrum Needs Study*[6/] demonstrated that significantly more spectrum access is required to meet immediate connectivity needs. It is also important to recognize that connectivity provided by Wi-Fi through low-cost RLANs delivers billions of dollars in value to the Australia's economy. Indeed, the economic value generated by Wi-Fi connectivity in Australia is estimated to exceed AU$44 billion in 2021 and AU$53 billion by 2025.[7/]

Wi-Fi Alliance Responses to the *Discussion Paper* Issues[8/]

1. What is the demand for spectrum for RLAN use in the 6 GHz band (5925–7125 MHz)?

Answer: As noted in the *Discussion Paper*, several countries recognized the unique benefits of the 5925-7125 MHz spectrum for RLAN deployments. These countries recognize that 5925-7125 MHz spectrum is needed to support rapidly growing demand for Wi-Fi and their gigabit connectivity objectives. UK's Ofcom, for example, projects that the demand for Wi-Fi will increase by up to 10 to 15 times over the next 10 years.[9/] There is clear consensus that currently available spectrum capacity (in 2.4 GHz and 5 GHz bands) is insufficient to accommodate existing Wi-Fi traffic, let alone the growth expected in the future. As ACMA accurately observed, the ever-growing number and diversity of Wi-Fi devices, along with increased connection speeds and data traffic volumes will soon exceed the capacity of spectrum currently available in the 5 GHz.[10/]

The *Discussion Paper* comes at a pivotal time in the development Wi-Fi ecosystem. Earlier this year, Wi-Fi Alliance introduced new Wi-Fi 6E terminology to distinguish the latest generation Wi-Fi 6 devices that are capable of 6 GHz operation.[11/] Wi-Fi 6E brings a common industry name for Wi-Fi users to identify devices that offer the features and capabilities of Wi-Fi 6 – including higher performance, lower latency, and faster data rates – extended into the 5925–7125 MHz band. Wi-Fi 6E devices are quickly becoming available, following regulatory approvals in several countries. The U.S. Federal Communications Commission ("FCC") already initiated regulatory certification of 6 GHz devices.[12/] As the 6 GHz regulatory landscape evolves, Wi-Fi

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5/ Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022**,** White Paper at page 18, available at https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.pdf

6/ Wi-Fi Alliance, *Spectrum Needs Study* at p. 23, Feb. 2017, available at https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy_0.pdf/33364

7/ *Discussion Paper* at 5.

8/ *Discussion Paper* at 3.

9/ UK Ofcom Consultation at Annex 6, available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0038/189848/consultation-spectrum-access-wifi.pdf

10/ Wi-Fi Alliance, *Spectrum Needs Study*, Feb. 2017, available at https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy0.pdf/33364.

11/ *See* Wi-Fi Alliance® brings Wi-Fi 6 into 6 GHz, WI-FI ALLIANCE (Jan. 3, 2020) *https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-brings-wi-fi-6-into-6-ghz.*

12/ *See* Part 15 Subpart E U-NII 6 GHz General Guidance Bands 5, 6, 7, 8, KDB 987594, Office of Engineering and Technology Knowledge Database (Feb. 4, 2021) https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=277034&switch=P .

Alliance member companies will expand the Wi-Fi 6E ecosystem even further.[13/] Analysts predict the first Wi-Fi devices to use the band will include Wi-Fi 6E consumer access points and smartphones, followed by enterprise-grade access points. Industrial environments are also expected to see strong adoption of Wi-Fi 6E to deliver applications including machine analytics, remote maintenance, or virtual employee training. Wi-Fi 6E will utilize 6 GHz to deliver much anticipated AR/VR use cases for consumer, enterprise, and industrial environments. The list of Wi-Fi 6E certified products is already growing.[14/] In 2021, over 300 million Wi-Fi 6E devices are expected to enter the market.[15/] Regulatory harmonization in the 5925–7125 MHz band will create economies of scope and scale and produce a robust equipment market, benefitting Australian businesses, consumers, and the economy.

Access to less than the entire 5925-7125 MHz band (1200 MHz) for license-exempt use would substantively reduce Wi-Fi 6E performance in terms of latency and data throughput. The 5925-6425 MHz band (500 MHz) does not provide sufficient spectrum to support future Wi--Fi connectivity. And there are no alternative frequency bands that may address expanding Wi-Fi spectrum requirements in the future. Wi-Fi Alliance respectfully asks the ACMA to note that the 5925-7125 MHz band is uniquely suited to accommodate the urgent need for additional Wi-Fi spectrum access for the following reasons:

- Self-coordinating, multi-channel Wi-Fi networks relying on dynamic random spectrum access and contention-based protocols require access to multiple channels to maintain acceptable performance. The current Wi-Fi standard (IEEE 802.11ax, Wi-Fi 6/6E) specifies channel bandwidths of up to 160 MHz, while the next amendment under consideration (IEEE 802.11be Extremely High Throughput) will specify channel bandwidths of up to 320 MHz. The 500 MHz is simply insufficient to accommodate multiple 320 MHz channels.
- The contiguous spectrum would allow for wider, non-overlapping Wi-Fi channels with harmonized technical conditions.
- Wi-Fi access to 5925-7125 MHz spectrum will enable new technologies, innovation and improvements in wireless connectivity.
- Existing Wi-Fi equipment designed for the 5 GHz band can be rapidly adapted and deployed in the 5925-7125 MHz band offering significant economies of scale and other benefits.
- Efforts to enable Wi-Fi in the 5925-7125 MHz band are already underway in many countries.[16/] While European regulators completed the initial step of opening the 5925-6425 MHz band (lower 6 GHz band) for licence-exempt use, there is broad recognition that a follow-up action is needed to address the projected demand for Wi-Fi spectrum (i.e., upper 6 GHz band).

The 1200 MHz of contiguous spectrum would enable 14 additional 80 MHz channels, 7 additional 160 MHz channels or 3 additional 320 MHz channels which are needed for high-bandwidth applications that require faster data throughput such as high-definition video streaming and virtual reality. Wi-Fi 6E and subsequent generations of Wi-Fi technology will leverage these wider channels and additional capacity to

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13/ See Product Finder, WI-FI ALLIANCE (last visited on Feb. 22, 2021) https://www.wi-fi.org/product-finder-results?sort_by=certified&sort_order=desc&certifications=1335.

14/ *See Product Finder,* WI-FI ALLIANCE (last visited on Feb. 22, 2021) https://www.wi-fi.org/product-finder-results?sort_by=default&sort_order=desc&certifications=1275; *see also* Wi-Fi 6E: Expanding Wi-Fi into 6 GHz spectrum (English), Video, Wi-Fi Alliance (Jan. 6, 2021) https://www.youtube.com/watch?v=oOZLhkaehzU.

15/ *See* Wi-Fi 6E: The Market Opportunity for Wi-Fi 6 in the 6GHz Spectrum Band, IDC Market Presentation (Apr. 2020) https://www.idc.com/getdoc.jsp?containerId=US46220720.

16/ *See* Countries Enabling Wi-Fi 6E at https://www.wi-fi.org/countries-enabling-wi-fi-6e

deliver greater network performance and support more Wi-Fi users at once, even in very dense and congested environments.

2. Should the ACMA proceed, as proposed, to consult on a formal variation to the LIPD class licence that adds the frequency range 5925–6425 MHz for RLAN use, bounded by the parameters described in the ACMA's preliminary view section of this paper?

Answer: Noting the concern that 500 MHz does not offer sufficient spectrum to support rapidly growing demand for Wi--Fi connectivity, Wi-Fi Alliance recommends that the ACMA authorize operation of RLAN low-power indoor ("LPI") devices at a limit of 30 dBm and 11 dBm/MHz, or in any location at a 'very low power' ("VLP") limit of 17 dBm and 1 dBm/MHz. These higher e.i.r.p. levels would facilitate consistent performance for wider channel of up to 320 MHz, advance the rapidly evolving Wi-Fi 6E ecosystem and enable implementation of new use cases in healthcare, wearables, IoT and other sectors. The ACMA should also note that in case of LPI RLANs, higher power levels are necessary to support Wi-Fi 6E enhanced data throughput capabilities to reach beyond one or two rooms without the need for signal extenders or additional equipment. And the VLP devices are largely personal network devices that are operated primarily indoors where they have even lower interference potential than the low-power indoor RLANs. Also, it is important to note that LPI limit at up to 30 dBm and VLP at up to 17 dBm e.i.r.p would be consistent with the regulations adopted by other administrations.[17/]

3. If class licensing arrangements are to be made in the lower 6 GHz band (by variation to the LIPD class licence), should alternative/additional power limits and/or other conditions be considered?

Answer: To derive most benefit and maximize harmonization, the ACMA should permit low-power indoor RLAN client devices to communicate directly with other low-power indoor RLAN client devices (i.e., client-to-client), not just with RLAN access points. Client-to-client connectivity supports a number of important use cases including onboarding equipment using smartphones, sharing streaming video from one device to another, and sharing files among users or devices quickly and efficiently. That is why the European regulators adopted rules that permit client-to-client connectivity [18/] while similar rules are under consideration in the U.S. [19/]

Also, the ACMA may consider reasonable and practical measures that are specifically intended to keep low-power RLAN access points indoors by requiring that indoor RLAN access points devices:

- cannot be weather resistant (i.e., no weatherized enclosures).

17/ FCC published Report and Order (FCC-20-51) ¶ 18 and 47 CFR.§ 15.407 (5). *Also see*, Brazil ANATEL Act No. 1306, 26 February 2021 at ¶ 11.7.1.1 and at ¶ 11.7.3.1 available at https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?eEP-wqk1skrd8hSlk5Z3rN4EVg9uLJqrLYJw_9INcO7uvjUt3vSOwT_4Z5fukj9yIzPErY4KWH5cpE9W_9hcTZkCG-vLPIdpXyuhgMG-L9M-uBLoSdAAXO0clb3SIt1i

18/ ECC Decision (20)01 On the harmonized use of the frequency bands 5945 to 6425 MHz for implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) at Table 1 on Pg. 6 available at https://docdb.cept.org/download/50365191-a99d/ECC%20Decision%20(20)01.pdf

19/ *The Office Of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communications in the 6 GHz Band*, Public Notice, ET Docket No. 18-295 and GN Docket No. 17-183, DA 21-7 (Jan. 11, 2021) ("*6 GHz Public Notice*"), available at https://www.fcc.gov/document/oet-seeks-info-6-ghz-u-nii-client-client-device-communications

- include integrated antennas and prohibit the capability of connecting other antennas to the devices, which will prevent substituting higher gain directional antennas and make the devices less capable or suitable for outdoor use.
- operate off mains power and prohibit these devices from operating on battery power.

Similar measures have been effectively implemented in other countries.

4. Is it appropriate to consider inclusion of the upper 6 GHz band (6425–7125 MHz) in the LIPD class licence or should this be deferred to monitor future developments (for example, in the wide-area International Mobile Telecommunications (IMT) space) as outlined in the ACMA's preliminary view? We invite comments from submitters on the utility of the band for IMT use.

Answer: Yes, authorization of the LIPD class licence devices (e.g., Wi-Fi) in the 5925-7125 MHz frequency band is feasible and the best use of the spectrum resource. Extensive technical analyses conducted in Europe and US confirm the feasibility of RLAN operations in the in the 5925-7125 MHz frequency band without interference to the incumbent services. Wi-Fi Alliance agrees that introduction of new RLAN applications must not disrupt or constrain important incumbent operations in the 5925-7125 MHz frequency band. Unlike IMT, Wi-Fi can operate in in the 5925-7125 MHz frequency band without causing interference to incumbent operations or requiring their relocation to another frequency band (if such frequency band is even available). Built on IEEE 802.11 standards, Wi-Fi has demonstrated its ability to coexist with and protect other spectrum users. These protections are inherent to Wi-Fi technology and are critical to its efficient operations on unlicensed basis worldwide. And Wi-Fi industry is committed to implementing technical, operational, and regulatory solutions that ensure coexistence with other services in the 5925-7125 MHz band. It is important to emphasize that these regulatory solutions are viable for Wi-Fi 6E implementations but are not practical for commercial IMT networks. Commercially viable IMT deployments require exclusive access to spectrum. It is, therefore, unrealistic to expect that ubiquitously deployed IMT networks can avoid interfering with and tolerate interference from other, incumbent operations in the 6425-7125 MHz band.

5. Should standard power (that is, higher power devices, including for outdoor use) operating under a dynamic spectrum access system such as the automatic frequency coordination (AFC) system adopted in the USA, be adopted in Australia for some or all of the 6 GHz band? Is there an appetite and capability for industry to provide the necessary systems to enable such use? We welcome views and evidence on the commercial and technical feasibility of introducing AFC systems in the band.

Answer: Yes, close regulatory alignment between Australia, U.S. and other countries will facilitate development and deployment of the AFC systems by leveraging the ecosystem built for the broader market. Currently, Wi-Fi Alliance and other industry organizations are actively developing technical specifications to enable AFC implementation. And the ACMA should preserve flexibility to foster a vibrant AFC ecosystem to enable continued innovation that will lead to increased competition and lower costs for the Australian consumers.

The AFC system approach ensures protection of incumbents while allowing this valuable spectrum to be used by the low-cost LIPD class licence devices to extend broadband coverage. Wi-Fi Alliance recognizes that the 6 GHz incumbent service deployments are not static, and the AFC systems will be designed to accommodate updates to account for possible changes in the 6 GHz incumbent operations.

Wi-Fi Alliance encourages ACMA to make sufficient and appropriate spectrum resources available to ensure that Australians continue to benefit from advancements in wireless technology. Recognizing the important role that standard-power RLANs can play in closing the digital divide by providing ubiquitous connectivity in underserved areas, Wi-Fi Alliance urges ACMA to allow access to the 5925-7125 MHz band.

Also, ACMA should consider allowing standard-power access points used in fixed point-to-point RLANs to operate at greater power levels. This allowance would provide wireless internet service providers

additional flexibility needed to relieve congestion in the 5 GHz band and extend the RLAN connectivity success to the 6 GHz band. To ensure that higher e.i.r.p. levels are used primarily for point-to-point operations, ACMA may specify a limit on the maximum conducted transmitter power (e.g., 30 dBm) and allow standard power point-to-point RLANs to employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power, thereby encouraging the use of higher gain, highly directional antennas.

6. Should the higher power regulatory arrangements and associated interference mitigation measures added to the International Telecommunication Union (ITU) Radio Regulations at WRC-19 (see *Resolution 229 (Rev WRC-19)*) in the 5 GHz band be included in any amendment to the LIPD class licence?

RLANs using IEEE 802.11 standards (i.e., Wi-Fi) have proven to be a tremendous success in providing affordable and ubiquitous broadband connectivity around the world. Over the last 18 years (since WRC-03), RLANs have evolved to become an integral component of the Australia's telecommunications infrastructure. The need for RLAN outdoor deployments is significant and includes:

- Remote and underserved areas,
- Smart cities and communities;[20]
- Mobile Data – volume of mobile data traffic offloaded to Wi-Fi significantly exceeds traffic carried (remaining) on cellular networks;[21]
- Locations which are increasingly expected to offer ubiquitous Wi-Fi access including outdoor areas such as sports arenas, municipal/private networks, parks, and other high traffic areas as well as indoor areas such as shopping malls, airports, hotels, restaurants, office buildings and schools;
- Sensors and connectivity for public transport, automotive, utilities, etc. rely on Wi-Fi connectivity;
- Internet of Things (IoT) technologies entail both indoor and outdoor deployments;
- Connected wearables and other consumer applications rely on Wi-Fi to support various use cases.

The problem of inadequate spectrum access for RLANs is exacerbated further by the fact that except for the band 5150-5250 MHz, other spectrum in the 5 GHz range harmonized for RLANs on a worldwide basis is subject to the dynamic frequency selection (DFS) constraint. The DFS constraint, albeit necessary, reduces spectrum access and raises equipment cost and complexity for RLAN implementations. Thus, the 5150-5250 MHz band offers unique advantages in addressing the growing need for RLAN outdoor access. Recognizing this fact, some administrations have adopted regulations that protect other operations while allowing limited RLAN operations outdoors in the 5150-5250 MHz band in coexistence with mobile-satellite-service (MSS) operations through e.i.r.p. limitations at higher antenna elevation angles. These rules are intended to prevent harmful interference to MSS Earth-to-space communications by limiting the aggregate noise received by the satellite. Wi-Fi Alliance urges the ACMA to adopt a similar regulatory framework that will enable much-needed RLAN outdoor deployments while ensuring protection of other operations in the 5150-5250 MHz band.

Wi-Fi Alliance encourages the ACMA to note that, at the conclusion of WRC-19, several administrations declared their intention to "*allow operation of stations in the mobile service in the band 5 150-5 250 MHz subject to other conditions than those contained in that Resolution 229, including higher power levels operate in the 5150-5250 MHz*."[22/] Given the growing list of countries with outdoor RLAN deployments in the 5150-5250 MHz, it would be timely to offer similar connectivity benefits in Australia. Also, the ACMA may wish to

[20] https://www.itu.int/en/ITU-T/ssc/Pages/default.aspx

[21] https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/vni-hyperconnectivity-wp.html

[22/] *See* World Radiocommunication Conference 2019 Final Acts, page 88, available at https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.14-2019-PDF-E.pdf

note the European countries are revising the regulatory framework for the 5150-5250 MHz band to enable installation of RLANs in road vehicles. [23/] Wi-Fi Alliance supports these efforts as the automotive Wi-Fi uses cases is a growing a

Conclusion

Policymakers worldwide recognize that wireless connectivity is increasingly dependent on Wi-Fi and other LIPD class licence technologies. And this *Discussion Paper* represents an important step toward making much-needed spectrum capacity available for RLAN operations in Australia. Wi-Fi Alliance appreciates the opportunity to contribute to the ACMA's efforts.

Respectfully submitted,

/s/ Alex Roytblat

WI-FI ALLIANCE
Alex Roytblat
Vice President of Regulatory Affairs
aroytblat@wi-fi.org

[23/] *See* European Commission Mandate to amend the technical conditions for WAS/RLANs in the 5 GHz band, available at: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66340 ; *Also see* Draft Revision of ECC Decision (04)08 "*On the harmonised use of the 5 GHz frequency bands for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLAN*)" available at: https://cept.org/files/9522/Draft%20revision%20of%20ECC%20DEC%20(04)08.docx