

## **Intel response to the ACMA consultation “Exploring RLAN use in the 5 GHz and 6 GHz bands”**

### **Intel’s General Views and Comments**

Intel commends ACMA for issuing the discussion and option paper on “Exploring RLAN use in the 5 GHz and 6 GHz bands” and appreciates the opportunity to provide comments.

Intel is an industry leader in creating world-changing technology that enriches the lives of every person on earth. We stand at the brink of several technology inflections—artificial intelligence (AI), 5G network transformation, and the rise of the intelligent edge—that together will shape the future of technology. Silicon and software drive these inflections, and Intel is at the heart of it all. Intel® Wi-Fi 6 (based on IEEE 802.11ax [7]) and 6E (Wi-Fi 6 implemented in 6GHz band) solutions enable the fastest wireless speeds for PCs, more responsive performance, with enhanced security and reliability, especially in dense environments.

We would like to underline the importance of releasing the entire 1,200 MHz (5.925–7.125 GHz) of spectrum in the 6 GHz band for unlicensed use to get maximum benefit for consumers from Wi-Fi 6E. Wi-Fi 6E is becoming a standard feature in devices and Australian citizens and industry should fully benefit from this opportunity like the other leading countries around the world. Indeed, a recent study by Telecom Advisory Services found that license-exempt networks like Wi-Fi generate two trillion dollars a year to the world’s economy, a number expected to grow to \$3.5 trillion by 2023<sup>1</sup>. The US FCC’s recent ruling on 6 GHz band (5.925–7.125 GHz) highlights the importance of economic and social benefits of Wi-Fi and Wi-Fi 6E. A study by WIFIFORWARD concludes that FCC’s Wi-Fi proceedings/ruling on 5.9 GHz and 6 GHz (5.925-7.125 GHz) will add \$183.44 billion to U.S. economy by 2025<sup>2</sup>.

### **Status of Regulatory Decisions**

The 6 GHz band is the spectral vehicle for Wi-Fi 6E to alleviate capacity constraints in the congested 2.4 GHz and 5 GHz bands and enabling new use cases such as augmented and virtual reality. The US, South Korea, Brazil, Chile, Peru, Saudi Arabia, and Costa Rica have already made the entire range from 5925 to 7125 MHz available on a license exempt basis. Other countries, including Canada, Mexico, Qatar, and Taiwan are expected to follow soon. Many other countries, such as Argentina, Guatemala, Honduras, Hong Kong, India, Jordan, Japan, Oman, and Singapore have either initiated consultation on the band or considering it.

At the European level, CEPT has already designated 5945-6425 MHz for license-exempt use and European Commission will publish their decision in the next few weeks, that all EU member states shall make the band available for the implementation of WAS/RLANs by 1<sup>st</sup> December. In the UK, Ofcom has decided to open the lower part of the band from 5925 to 6425 MHz on a

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<sup>1</sup> Economic Value of Wi-Fi available at <http://valueofwifi.com>

<sup>2</sup> <http://wififorward.org/wp-content/uploads/2020/04/5.9-and-6-GHz-Katz-Study-Executive-Summary-FINAL.pdf>

license-exempt basis for low power indoor and very low power outdoor use. The UAE also authorized 5925 – 6425 MHz band for indoor unlicensed operation.

## **Product Status**

It is also important to note “Wi-Fi Alliance’s Wi-Fi 6E Certification Program” and following information<sup>3</sup>;

*“Wi-Fi 6E will see rapid adoption in 2021 with more than 338 million devices entering the market, and nearly 20 percent of all Wi-Fi 6 device shipments supporting 6 GHz by 2022,” said Phil Solis, research director at IDC. “This year, we expect to see new Wi-Fi 6E chipsets from several companies, and a variety of new Wi-Fi 6E smartphones, PCs, and laptops in the first quarter of 2021 followed by TVs and VR product announcements midyear”.*

Intel® Wi-Fi 6E (Gig+) products kicked off production in Q4’2020 and received Wi-Fi Alliance and FCC certifications in Q1’2021. At CES’21, these solutions were highlighted as key ingredients for new Intel® notebook and desktop PC platforms that will ramp throughout 2021. Several manufacturers announced new Q1’21 PC models for commercial and gaming market segments that will include Intel® Wi-Fi 6E (Gig+) products. We expect to see similar announcements from additional PC vendors throughout 2021.

In the following, we would like to provide comments and responses to ACMA’s questions on 6GHz and 5GHz.

## **Response to Consultancy: 6GHz**

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

According to Quotient Associates<sup>4</sup>, there will be a worldwide shortfall of Wi-Fi spectrum of up to 1.6 GHz in the mid-frequency range by 2025 that will limit the performance and availability of broadband wireless services directly impacting citizens and businesses. Wi-Fi 6 will need access to spectrum at 5925-7125 MHz to utilize multiple non-overlapping wide channels. Therefore, authorization of 5925-7125 MHz for unlicensed use is required to enable Gigabps indoor connection capability as provided by the technology. As explained above, commercial products are already available in the market and Australia should start benefiting from this opportunity by providing access to sufficient spectrum in the 6 GHz band.

The 6 GHz band for Wi-Fi 6E alleviates capacity constraints in the congested 2.4 GHz and 5 GHz bands and enables new innovative use cases and applications such as augmented and virtual reality.

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<sup>3</sup> <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-delivers-wi-fi-6e-certification-program>

<sup>4</sup> Wi-Fi Spectrum Needs Study, Quotient Associates, February 2017

Opening the 6 GHz for unlicensed use such as Wi-Fi will also accelerate the deployment of 5G-capable networks. If vendors can deliver the same Wi-Fi equipment in multiple regions, end-users will benefit from greater economies of scale, lower prices and a more diverse supplier base. In the 5G era, more than 70% of mobile traffic will be offloaded to Wi-Fi<sup>5</sup> (up from about 50% today), as seen in Figure 1.

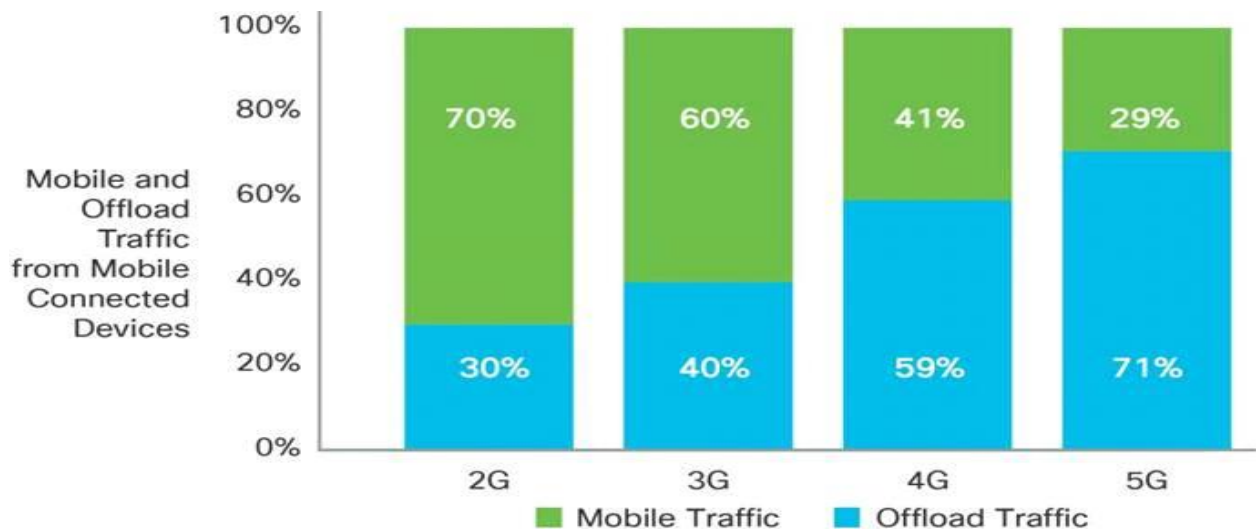


Figure 1. Mobile Data Traffic and Offload Traffic, 2022 (Cisco)

Therefore, timely assignment of sufficient amount of contiguous spectrum both for 5G and Wi-Fi as complementary technologies in different frequency bands can help advance Australia's objectives.

In general, Wi-Fi brings the greatest benefit to the economy in four key categories: 1) developing alternative technologies to expand consumer choice, 2) creating innovative business models to deliver unique services, 3) expanding access to communications services for fixed and mobile networks, and 4) complementing wireline and cellular technologies to enhance their effectiveness. Specifically, Australia should benefit from the above by designating LIPD class license to the 6 GHz band (5925-7125 MHz) to realize the full potential of Wi-Fi 6E.

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?

While Intel supports ACMA's proposal to open part of the 6GHz band for LIPD class license, we would like to underline the importance of releasing the entire 1,200 MHz (5.925–7.125

<sup>5</sup> <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.html>

GHz) for LIPD class license use to get maximum benefit from technologies such as Wi-Fi 6E. Therefore, we strongly recommend enabling unlicensed use in 5925 – 7125 MHz

Only access to the full range between 5925 and 7125 MHz allows the full use of 7 contiguous 160 MHz channels (Refer to Figure 2), as a key differentiation factor of Wi-Fi 6E over previous generation of Wi-Fi. Opening the full 6GHz band also supports 3 non-overlapping 320 MHz channels for the next generation of Wi-Fi (Wi-Fi 7 based on IEEE 802.11be [8]). It should be noted that the current 5 GHz spectrum does not enable any 160MHz channel without Dynamic Frequency Selection (DFS) requirements. Likewise, the 6 GHz band is the most suitable for the future growth of Wi-Fi due to its propagation characteristics and cost-savings in RF design due to its proximity to existing deployments in the 5 GHz band. These contiguous blocks of spectrum accommodate wider channels of 160 MHz, and soon, 320 MHz channels that are necessary for applications that demand high bandwidth, such as HD video consumption and other lower latency applications such as virtual or augmented reality.

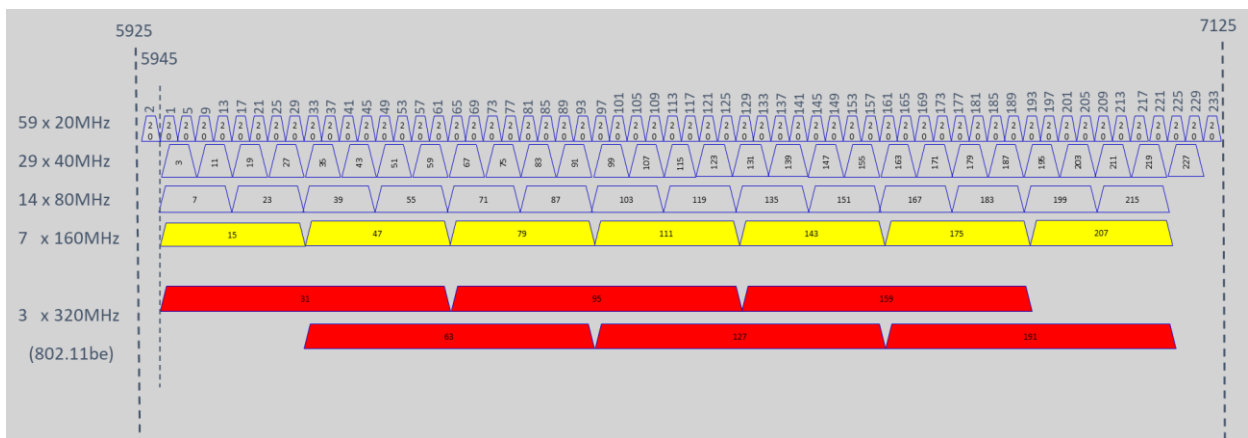


Figure 2. IEEE 802.11ax [7] (Wi-Fi 6E) and 802.11be (Wi-Fi 7) 6GHz Channelization [8]

With regards to the parameters described in the ACMA's preliminary view section of the paper and considering ACMA invitation to provide views on Options stated in the paper, Intel would like to propose the following modified set of parameters for 6GHz band.

**Low Power Indoor (LPI):** Intel recommends authorizing LPI devices to operate Indoor only throughout the 5925-7125MHz band at the maximum power level of 30 dBm for devices with up to 160 MHz channels and 33 dBm for Wi-Fi 7 with 320MHz channel bandwidths. Intel supports ACMA proposal for Power Spectral Density (PSD) limit of 11 dBm/MHz EIRP for LPI Mode. Intel also strongly supports authorizing Client to Client communication throughout the 5925- 7125MHz band.

**Very Low Power (VLP):** Intel recommends authorizing VLP devices, for operation in Indoor and Outdoor, over the entire 5925-7125 MHz band with Max Tx Power of 14 dBm EIRP for channel bandwidth of up to 160MHz and 17 dBm EIRP for Wi-Fi 7 channels of 320MHz wide.

Intel supports ACMA's proposed Power Spectral Density (PSD) limit of 1 dBm/MHz EIRP for VLP Mode.

**Standard Power (SP):** Intel recommends authorizing Standard Power mode for Indoor and Outdoor, using AFC System to protect incumbent Fixed Services, in the entire 5925-7125MHz band, with max Tx power of 36 dBm EIRP Power Spectral Density (PSD) limit of 23 dBm/MHz EIRP.

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?

Please refer to response to Question 3 above.

4. Is it appropriate to consider inclusion of the upper 6 GHz band (6425–7125 MHz) in the LIPD class license 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.

Intel strongly recommend authorizing LIPD class license over the entire 6425-7125 MHz band. While Intel supports administrations allocations of spectrum both for licensed and license-exempt usages, we believe the 6GHz band is best suited for LIPD class license allocation to most effectively address the shortage of Wi-Fi spectrum to contribute to the lives of the Australian people and pave the way for innovation of the new use cases and applications.

In addition, based on the results of the coexistence studies conducted [1]-[6], we believe that license-exempt WAS/RLAN equipment can coexist with current incumbent services.

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.

We believe that current work in the industry on the development of AFC systems for standard power devices can be extended to support ACMA AFC mode based on ACMA RRL database to protect incumbent fixed services. The AFC Systems targeting compliance to US FCC requirements are being developed reasonably flexible to support similar but regionally customized regulations internationally. Wi-Fi Alliance is also working on development of AFC Systems and AFC Devices compliance specifications that are flexible to cover regional regulatory requirements.

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?

Please refer to response to 5GHz Consultancy below.

### Response to Consultancy: 5GHz

1. Should Australia implement the changes introduced to the 5150–5250 MHz frequency range at WRC-19 (see the [ITU section](#) in Appendix B)?

Intel recommends that ACMA adopt provisions from the WRC-19 resolution for 5150-5250MHz especially with respect to outdoor operation and higher power usage in the band. Intel recommends ACMA consider the further options for higher power of maximum 1W (30 dBm) EIRP as permitted by Resolves 3 of Resolution 229 (**WRC-19**).

2. Are there other arrangements in place internationally that could be beneficial to be incorporated into Australian regulations?

Intel notes that Resolution 229 (WRC-19) permits outdoor operation in 5250-5350 MHz . Therefore, the most important other change would be to permit outdoor operation in the 5250-5350 MHz band. In addition, Resolution 229 also permits operation throughout 5470-5725 MHz. In Australia, the current carve out of 5600-5650 MHz precludes use of an additional 80 MHz/160 MHz channel in 5 GHz; any reconsideration to permit operation in 5600-5650 MHz would be very helpful to enable more wide bandwidth channels and more efficient use of the 5GHz band in Australia.

3. Are there other changes to the LIPD class licence for the 5 GHz band that the ACMA should be investigating?

No response.

### References

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- [2] RKF report (commissioned by 6USC, studies VLP):  
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- [3] ECC report 302 (CEPT report with multiple studies developed by European administrations and industry): <https://www.ecodocdb.dk/download/cc03c766-35f8/ECC%20Report%20302.pdf>
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- [5] 6USC VLP Sharing Study:  
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- [6] Ex parte filed by CableLabs, March 30, 2020:  
<https://www.fcc.gov/ecfs/filing/1033043576413>
- [7] IEEE P802.11ax™/D8.0 Draft Standard for Information technology— Tele-communications 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, October 2020
- [8] IEEE P802.11be™/D0.4 Draft Standard for Information technology— Tele-communications 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 8: Enhancements for extremely high throughput (EHT), March 2021