



www.qualcomm.com

December 3rd, 2021

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

Email: xavier.halliwell@acma.gov.au

Qualcomm Incorporated (Qualcomm) welcomes the opportunity to provide input to the Australian Communications and Media Authority (ACMA) *Proposed updates to the LIPD Class Licence for 6 GHz RLANs Consultation paper* ("the Discussion Paper").

Qualcomm is the world's leading wireless technology innovator and the driving force behind the development, launch, and expansion of 5G. When we connected the phone to the internet, the mobile revolution was born. Today, our foundational technologies enable the mobile ecosystem and are found in every 3G, 4G and 5G smartphone. We bring the benefits of mobile to new industries, including automotive, the internet of things, and computing, and are leading the way to a world where everything and everyone can communicate and interact seamlessly. From our homes, to airports, campuses, and the enterprise, Qualcomm's Wi-Fi solutions build on our world-class engineering capabilities to connect users and devices.

Qualcomm Incorporated includes our licensing business, Qualcomm Technology Licensing (QTL), and the vast majority of our patent portfolio. Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of our engineering, research and development functions, and substantially all of our products and services businesses, including our Qualcomm CDMA Technologies (QCT) semiconductor business.

One of our major areas of focus is the development of advanced wireless technologies, including 5G and Wi-Fi based technologies.

In this response, Qualcomm updates the information related to new unlicensed and shared spectrum use that it provided in response to the ACMA's *Exploring RLAN use in the 5 GHz and 6 GHz discussion and options paper* and provides specific answers to the ACMA's *Proposed updates to the LIPD Class Licence for 6 GHz RLANs Consultation paper*.

1 Introduction

The 6 GHz band (5925-7125 MHz) is the only expansion band currently under study by the ACMA for class licensed technology usage that can alleviate the increasing congestion in existing spectrum used for those technologies (including Wi-Fi), those bands being 2.4 GHz and 5 GHz. Class licensed technologies are

widely used in everyday life to connect an ever-increasing number of devices from smart phones and personal computers to baby monitors, security cameras, and IoT devices in residential, educational, and commercial settings. Use cases are emerging showing the complementary nature of 5G NR mmWave applications and Wi-Fi 6E, the 6th generation Wi-Fi that operates in the 6 GHz band, to ensure that eMBB capability is reticulated to users rapidly and conveniently. For example, in Korea 5G NR mmWave provides broadband connectivity from trackside to subway trains which is then reticulated to passengers using Wi-Fi 6E operating across the entire 1200 MHz of the 6 GHz band to achieve peak connections speeds of 1.8 Gbps¹.

Technologies like Wi-Fi 6E and 5G NR-U are uniquely suited, and designed, to share with other services especially the Fixed Service and Fixed Satellite Service operating in the 6 GHz band, the pressure on these technologies to deliver higher capacity last mile throughput across a range of devices will only increase, especially as 5G NR mmWave FWA services are deployed. Opening the full 1200 MHz in the 6 GHz band for class licensed technology like Wi-Fi 6E and NR-U is required to provide higher performance and seamless end-to-end connectivity within the wireless device ecosystem.

2 Updates on 6GHz ecosystem and related products

As noted in Qualcomm's prior submission Wi-Fi standards for the 6 GHz band are in place and ready for use when the spectrum is made available and 3GPP has completed two projects in Release 16 for anchored and standalone NR-U.

Exploiting the standards, Qualcomm Wi-Fi 6 networking platforms integrate advanced multi-user technologies, and Wi-Fi 6E platforms to leverage 6GHz spectrum for performance that is reliably fast, responsive and resilient to congestion.

To deliver multi-gigabit connectivity that meets the surging demands of the most advanced modern home networks, NETGEAR has announced the world's first Wi-Fi 6E, 16-stream Quad-band mesh system. Built with Qualcomm's Networking Pro Series 1610 platform, this device has four 4x4 radio configurations, allocated to IoT devices, legacy and current Wi-Fi 6 and 6E clients, as well as dedicated backhaul radios. NETGEAR's new Orbi RBKE960 uses dedicated 5 GHz or 6 GHz streams for mesh backhaul, which means more consistent and higher performance for devices. The wider channels (160 and 320 MHz) of the 6 GHz band provide sufficient bandwidth for mesh backhaul to support the efficient communications of increasing numbers of connected Wi-Fi devices.

The IoT is expanding at an exponential rate, revolutionizing the digital landscape, and connecting technology on a global scale. By 2025, it is predicted there will be 55.7 billion connected devices worldwide², 75% of which will be connected to an IoT platform. The IoT is set to be the lynchpin of 'smart cities' of the future, with research, planning and funding increasing across the globe. IoT is also supporting the businesses and employees embracing the flexible working movement that has been largely catalyzed by the pandemic. The IoT spans numerous use cases with diverse connectivity demands, requiring both high bandwidth and low power, low latency capabilities. While difficult to meet these demands with a single technology in the past, Wi-Fi 6 offers the solution. Wi-Fi 6E then extends these great benefits into the 6 GHz band, which offers significant increases in available bandwidth. Because every device in the 6 GHz band must support Wi-Fi 6, there is no overhead to accommodate previous Wi-Fi generations. Wi-

¹ MSIT PR "Subway WiFi Speed Up, Up, Up using 5G 28GHz" - in Korean. Sep. 29, 2021

² <https://www.idc.com/getdoc.jsp?containerId=prAP46737220>

Wi-Fi 6E takes full advantage of the increased bandwidth, less congested spectrum, and up to seven super-wide channels in 6 GHz to deliver innovations like AR/VR, 8K streaming, and more. Full advantage of this opportunity only comes when the full 1,200 MHz of unlicensed spectrum in 6 GHz is made available to Wi-Fi.

Windows 11 is finally available to the public. With the new PC operating system comes performance enhancements for many different aspects of the computing experience. A new feature in Windows 11 is Wi-Fi Dual Station, a technology developed in partnership with Qualcomm that promises to improve online gaming performance. Wi-Fi Dual Station takes advantage of the inherently low latency nature of Wi-Fi 6 to deliver two simultaneous streams of packets from a game server to the client device. In the event of collisions or packet loss over wireless (either due to interference or poor signal), the technology mitigates the fallout by switching to the best available connection. To enable this, Microsoft pairs the dual-band feature, common in most routers, with Qualcomm's FastConnect 6900, which supports 4-stream DBS (Dual Band Simultaneous) and can send two simultaneous streams of data over 2.4 GHz, 5 GHz and/or 6 GHz. Games are far more latency-sensitive than they are bandwidth-intense, allowing them to take advantage of potentially better signal on either band.

Another important development was made in October this year when Qualcomm announced cutting Edge ultraBAW filter technology to extend its Radio-Frequency portfolio up to 7 GHz to enable high performance Next Generation 5G and Wi-Fi Solutions. Access to spectrum in the 7 GHz band will enable next-generation mobile devices, laptops, as well as numerous solutions for Automotive, IoT, and industrial applications leading to enhanced performance and power efficiency indoors and outdoors. Qualcomm ultraBAW also supports ultra-wide channels of up to 300 MHz enabling faster downloads and uploads. Qualcomm ultraBAW now provides support for critical Wi-Fi bands including 5 GHz and the newly adopted 6 GHz band for Wi-Fi 6E and future Wi-Fi standards. Commercial devices featuring this technology are expected to launch in the second half of 2022.

3 Updates on other national arrangements

The present regulatory status of the 6 GHz band in the context of unlicensed use is: the US, Canada, South Korea, Brazil, Guatemala, Chile, Peru and Saudi Arabia have opened the whole 1,200 MHz for license-exempt use and Mexico, Colombia, Costa Rica, Jordan, Tunisia³, Oman and Qatar are considering a similar action. Malaysia is currently consulting on the 6 GHz and has proposed the full 1200 MHz for unlicensed use⁴.

Most recently the Canadian regulator released its technical rules for Low Power Indoor operations in the 6 GHz band, which are closely aligned with those in the US but also have provisions to protect C-V2X operations in the lower adjacent band⁵. A more detailed treatment of adjacent band protection is provided in section 4.1 below.

In Europe and Morocco, 480 MHz has been adopted for unlicensed technologies such as Wi-Fi 6E and 5G NR-U. The long-term impact of not having access to the full 1200 MHz of the 6 GHz band may lead to shortcomings in digital productivity, innovation, and generally fewer opportunities in wireless. Fortunately, Croatia, Czech Republic, Cyprus, Denmark, Ireland, Lithuania, and Slovakia have led CEPT to

³ <https://drive.google.com/file/d/1wYKOboOoBcKS3UTawvcQMNmBJPsfaKx6/view>

⁴ https://www.mcmc.gov.my/skmmgovmy/media/General/pdf/Notice_PC_WiFi.pdf

⁵ <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11750.html>

open a work item for the study of upper 6 GHz spectrum sharing with Wi-Fi. The work item is to “study possible technical conditions under which Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) could operate and coexist with existing services in the 6425-7125 MHz band, and any additional studies, dependent upon the CEPT position and the results of WRC-23 Agenda Item 1.2”. At this point, from an examination of the sharing studies being undertaken in ITU-R relative to Agenda Item 1.2, it remains unclear how IMT sharing with incumbent users of the band would be implemented practicably given the wide-area mobile nature of cellular technology. The creation of the CEPT work item on the upper 6 GHz band, and difficulties coming to light through the ITU-R studies in relation to the 6 GHz band reduces the attractiveness of this band for an IMT identification in Region 1.

In the APAC region, there is progress within the APT Preparatory Group for WRC-23 (APG23-3) in the context of Agenda Item 1.2 and the 6 GHz band. Importantly, the APT preliminary position for the 6 GHz band under Agenda Item 1.2, as it currently stands, limits a global (hence Region 3 applicable) IMT identification to only the 7025 – 7125 MHz band subject to the results of ITU-R studies. This suggests that there is little motivation for an IMT identification, other than possibly the 7025 – 7125 MHz band, from the majority of Region 3 countries.

Noting that the trend in the majority of ITU-R Region 2 countries is to authorize the 5925 – 7125 MHz for “unlicensed” use, indeed the two most populous (the US and Brazil) have already done so, there is a strong motivation for Australia and other Region 3 countries to align with Region 2 and realize immediate economies of scales and economic and social benefits that accrue from “unlicensed” or class licensed use of the full 1200 MHz of the 6 GHz band.

Qualcomm commends the ACMA’s stated position of being “open to investigating further opportunities for RLAN use in the upper 6 GHz band” and we advocate that the ACMA take positive steps to swiftly complete these investigations which we believe will lead to Australia opening the full 1200 MHz for class licensed use.

4 ACMA Questions

4.1 Lower 6 GHz band/proposed update to the LIPD Class Licence

1. Are the proposed out-of-band emission limits of -37 dBm/MHz for outdoor very low power (VLP) devices and -27 dBm/MHz for low power indoor devices suitable, both in terms of protecting intelligent transport systems (ITS) services and their effect on the operation of RLAN devices near/adjacent to the 5925 MHz boundary?

Qualcomm concurs with the ACMA that, in conjunction with indoor operation, an out-of-band emission (OOBE) limit of -27 dBm/MHz limit for LPI operation above 5925 MHz is sufficient to ensure co-existence of ITS (C-V2X) operating below 5925 MHz.

Unlicensed VLP devices are expected to operate indoor and outdoor and the lower transmit power will allow them to coexist with incumbent services when operating outdoors. However, VLP devices and ITS (C-V2X) services are expected to operate in close proximity, both may be operating in the same vehicle and alongside other vehicles in slow- and fast-moving traffic schemes, so for VLP devices a more stringent OOBE limit of -37 dBm/MHz (RMS) at 5925 MHz is required as well as additional operational measures to ensure coexistence.

In the discussion paper the ACMA notes; “that some measures are prudent to support coexistence with ITS in Australia”, and “that ITS use in the US is more closely aligned with Australian than with

European arrangements” so Qualcomm recommends that the ACMA adopt measures that a coalition of; Qualcomm, Broadcom, Cisco, Facebook and Intel have proposed for adoption in the US, Canada and Brazil that is⁶:

1. VLP devices shall comply with an out-of-band emissions level of -37 dBm/MHz measured by root mean square (RMS) at 5925 MHz.
 2. VLP devices shall prioritize unlicensed operations in channels above 6000 MHz before beginning operation below 6000 MHz. Manufacturers should be required to submit with their application for equipment authorization a declaration that the equipment complies with this prioritization rule.
2. Is the specification of contention management protocols in the LIPD Class Licence necessary to enable equitable access between potentially competing technologies such as RLANs and 5G new radio-unlicensed (NR-U) services? If so, is the proposed condition, and the language used to express it, appropriate?

Qualcomm commends the ACMA for taking a technology neutral approach to unlicensed access to the 6 GHz band. Such an approach will allow different technologies to access the band and for those technologies and the associated use cases to evolve unhindered whilst lowering the regulatory overhead in regulating said use.

Qualcomm is of the view that explicit requirements in the LIPD class license are not necessary to ensure co-existence, because as a matter of compliance with the relevant standards the ACMA can require a declaration of the contention protocol employed, for example that implemented in IEEE 802.11.

3. Are there any broader comments on the proposed update to the LIPD Class Licence?

The ACMA may wish to consider the following technical conditions for Low Power Indoor (LPI) operation that assists more effective use of wide band operations as follows:

- maximum power 30 dBm EIRP
- maximum power density 11 dBm/MHz EIRP

4.2 Upper 6 GHz band/higher power RLAN devices

4. Should the ACMA make arrangements that permit high-gain directional antennas (for example, for wireless internet service providers in remote areas) under a class licensing regime?

Yes. The use of high-gain directional antennas will be useful for extending broadband services especially in rural and remote areas where the populations are dispersed. However, the ACMA must put in place a suitable framework to ensure co-existence with other licensed incumbent operations (see question 5 and 6 below), especially fixed links which may be employed for similar point-to-point purposes. Qualcomm notes that the narrower 3dB beamwidth, and greater side-lobe suppression of higher gain antennas may increase the geographic coexistence and frequency sharing opportunities in the 6 GHz band.

⁶ Broadcom, Cisco, Facebook (now Meta Platforms), Intel, and Qualcomm March 1, 2021 Letter to FCC in ET Docket No. 18-295 available at <https://ecfsapi.fcc.gov/file/10301179588420/OOBE-limit-Compr%20Letter%203%201%202021.pdf>

5. If 'high power' class-licensed devices were to be introduced under an AFC system, what aspects of the system would need to be considered in setting it up? Is there interest from industry in administering such a system?

Qualcomm supports the adoption of higher power devices using an Automated Frequency system (AFC) and the online nature of the ACMA's Register of Radio Licensing (RRL) is ideally suited to support such a system.

In the context of this submission paper higher power devices are referred to as 'Standard Power' (SP) devices which when combined with AFC enable coexistence assured outdoor operation and higher power indoor operations to realize whole-home coverage and a wider range of use-cases/applications in indoor and outdoor environments.

An AFC system once implemented is more efficient and dynamic than a manual apparatus licensing scheme. With a manual apparatus licensing system, the RRL will be interrogated once prior to engineering and licensing device operation, the license is not easily modified, and device operation not easily adjusted should the surrounding radio environment change e.g., if a fixed link license is cancelled or a new licence is registered. On the other hand, AFC devices may automatically interrogate the RRL and, if required, the interrogating device's operation may be adjusted to optimize spectrum usage within a changing radio environment.

As 'high power' and AFC is being considered and likely be authorized in multiple national jurisdictions AFC capability will likely be included in 'high power' devices manufactured for a global market. It follows that Australia should plan to take full advantage of AFC features and benefits to extract maximum utility of the 6 GHz band in indoor and outdoor scenarios.

6. o If 'high power' class-licensed devices were to be introduced under an AFC system:
- Is there interest from industry in administering such a system?
 - Are there any impediments to developing and/or operating a system in Australia? What could be done to help enable, or otherwise encourage, the development and/or operation of a system in Australia?
 - To what extent would an Australian system need to be aligned with those to be implemented elsewhere? What scope could there be for customisation in an Australian system?
 - What aspects of an AFC system would need to be considered in the design, establishment, and ongoing operation, of such a system, including:
 - o regulator and industry commitments
 - o technical spectrum coordination and coexistence rules – for example, a tiered hierarchy framework for spectrum uses
 - o IT infrastructure and system design, including security and system reliability issues
 - o communication interfaces between an AFC system, the ACMA's Register of Radiocommunications Licences (RRL) and devices
 - o ongoing interaction between the ACMA and system operators

To enable ease of implementation, reduce development costs, and improve economy of scale for those developing AFC systems, Australia should align with a similar model that being considered in the US and Canada. The FCC framework which will permit 'high power' operation in the 5.925-6.425 GHz and 6.525-6.875 GHz portions of the 6 GHz band is soon to be enabled. Indeed, the [FCC recently issued a public notice](#) on this topic. Key points of the notice address include:

- that it begins the process for authorizing standard power unlicensed operations in the 6 GHz band by inviting proposals from parties interested in operating an AFC system in accordance with the *6 GHz Report and Order*

- it summarizes the requirements for AFC systems as set forth in that order, describes the information that must be provided with proposals to operate an AFC system, and describes the procedures for designating AFC system operators
- many of the aspects of the AFC system to be considered including those mentioned in question 6 above.

The AFC system will prevent harmful interference to fixed links and radio astronomy observatories in the permitted bands. Once per day each AFC system is required to access the Commission's Universal Licensing System (ULS) to obtain the most up-to-date information on licensed microwave links including their transmitter and receiver locations, frequencies, bandwidths, polarizations, transmitter EIRP, antenna height, and the make and model of the antenna and equipment used. The AFC systems will use this information, along with the propagation models specified in the 6 GHz Report and Order, to determine on which frequencies and at what power levels standard-power devices may operate. In making this determination, the AFC systems will ensure that the predicted interference-to-noise (I/N) ratio at any microwave receiver does not exceed -6 dB. The AFC systems must be capable of determining frequency availability for the standard-power device at the maximum permitted EIRP of 36 dBm and also at power levels as low as 21 dBm.

The FCC's Office of Engineering and Technology (OET) will follow a multistep process to approve/certify AFC systems in which each prospective AFC system operator must demonstrate its ability to perform the required functions pursuant to the Commission's 6 GHz unlicensed rules. The deadline for submission for applications to the OET process is November 30th, 2021. US industry has been developing AFC systems for implementation in the US according to this timeline. To this end Qualcomm filed its application with the FCC to become an Automated Frequency Coordination ("AFC") system operator to support standard power operations in the FCC's 6 GHz unlicensed band allocated by the FCC in the United States. This is a critical step towards supporting more robust unlicensed operations in outdoor environments and in indoor settings that will benefit from improved coverage. We look forward to working with the FCC towards approval of our AFC system in 2022. Industry is highly interested in the concept and delivery of AFC: there are currently over 10 applications from companies wishing to be certified as AFC systems operator⁷.

The ACMA's RRL is similar in concept to the FCC's ULS. To facilitate the development and implementation of an AFC system in Australia the ACMA should, at least, make the licensing data in 6 GHz available to public in an automated online machine-readable format (such as http, ftp) so that AFCs can access and use the most up-to-date or even real-time data.

7. If 'high power' devices were to be introduced under a manual registration process, what might those arrangements look like? Would the introduction of apparatus licensing for such devices be an appropriate option?

The ACMA should take all steps required to implement AFC in Australia. The benefits of an automated, dynamic system vastly outweigh a mostly static system. However, if AFC is difficult to implement in the short term a manual system may be a useful stop gap measure.

8. Would there be advantages in implementing different licensing and/or access management arrangements in different geographic areas for the use of high power RLAN devices?

⁷ https://www.fcc.gov/ecfs/search/filings?limit=100&proceedings_name=21-352&sort=date_disseminated,DESC

Qualcomm believes that the combination of LPI, VLP and SP with AFC enabled via a single licensing and access management regime, i.e. via the LIPD class licence, provides the prospective unlicensed 6 GHz band user with a simple, convenient and easily understood access management regime for multiple technologies. As noted above an AFC may provide for the class licensed deployment of radio services with maximum permitted EIRP of 36 dBm. An AFC system provides dynamic flexibility making different licensing and/or access management arrangements redundant.

9. Are there additional sharing scenarios and/or studies relevant to this band that have not been identified in this paper?

Relevant sharing studies were communicated in Qualcomm's prior submission to the ACMA.

4.3 5 GHz band

10. In addition to comments made to the April 2021 consultation paper, do you have any comments on the other proposals for updates to the 5 GHz band listed in this paper?
11. If outdoor and/or higher power RLAN devices were authorized in parts of the 5 GHz band (for example, 5150–5250 MHz), would it be appropriate to implement measures similar to those being considered for high power devices in the 6 GHz band (for example, a registration system, or apparatus licensing)?
12. If high power devices were to be authorized in both the 5 GHz and 6 GHz band, would it be appropriate to use the registration/authorization method and system for both?

We have no comment to make in relation to the 5 GHz band at this time.

5 Conclusion

In order to ensure the greatest utility and socio-economic value of this important spectrum band for Australian businesses and consumers, Qualcomm strongly encourages the ACMA to move towards opening the entire 1200 MHz of the 6 GHz band for class licensed use on a technology basis in a stepwise manner:

- open the lower 500 MHz of the 6 GHz band (5925 – 6425 MHz) for VLP and LPI at the earliest opportunity;
- open the upper 700 MHz of the 6 GHz band (6425 – 7125 MHz) for VLP and LPI via a further update to the LIPD class license;
- to complete considerations related to the authorization/certification of AFC systems, so as to allow an update to the LIPD class license for Standard Power with AFC [in 2022].

Should you have any questions or comments on this submission, please do not hesitate to contact me at +852 6901 0087 (mobile) or aorange@qti.qualcomm.com.

Sincerely,



Alex Orange
Senior Director, Government Affairs, Southeast Asia, Taiwan & the Pacific
Qualcomm Inc.

Cc: Alex Fernandez, Sr Dir, Business Development, Qualcomm Australia