



www.qualcomm.com

May 5th, 2021

The Manager
Spectrum Management Outlook and Strategy Section
Spectrum Allocations Branch
Australian Communications and Media Authority
PO Box Q500
Queen Victoria Building NSW 1230

Email: spectrumworkprogram@acma.gov.au

1.1 Introduction

Qualcomm Incorporated (Qualcomm) welcomes the opportunity to provide input to the Australian Communications and Media Authority (ACMA) Draft Five-year spectrum outlook 2021-26 – consultation 10/2021 (the Draft FYSO).

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.

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.

Qualcomm supports the development of a forward-looking Radio Spectrum Plan such as the ACMA's Draft FYSO. These types of plans are an important tool for industry to understand the spectrum and timeline priorities of the Government. This in turn allows the industry to provide input on the suitability of the plan, the market readiness of technology, the state of development of product ecosystems, and allows prospective licensees of the radio spectrum to plan their future spectrum and network investments.

One of our major areas of focus is the development of 5G technologies, including those that leverage low-band, mid-band, and high-band spectrum. In 2019 5G became a reality and 2020 and 2021 have seen worldwide deployments of 5G technology and increased reliance on wireless connectivity in the face of the COVID-19 pandemic.

In this response, Qualcomm provides information related to the allocation of spectrum for 5G NR in the 40 GHz, 600 MHz, and 3.3 GHz bands, as well as continued progress on the planning of the 6 GHz band for radio local area networks (RLANs) and other unlicensed technologies and the use of the 5.9 GHz band for intelligent transportation systems (ITS) through modifications to the ITS class license.

1.2 37-43.5 GHz (40 GHz band)

As noted in the Draft FYSO, the 2019 World Radiocommunication Conference (WRC-19) identified the 40 GHz band on a global basis for International Mobile Telecommunications (IMT). Following this identification, the 40 GHz band is receiving support for global harmonization. Importantly, the band is not extensively encumbered. In the United States, the FCC has identified the 37-40 GHz for 5G use and conducted auctions to assign the spectrum. China's MIIT conducted a public consultation on the use of the 37-42.5 GHz band for 5G and plans to use the band for 5G trials, while Hong Kong announced just last month that it tentatively plans to award spectrum in the 39.5-43.5 GHz range for mobile and fixed wireless service in 2022 or 2023. In addition, the EU Radio Spectrum Policy Group has identified the 40.5-43.5 GHz band as a long-term 5G band.

In addition to consideration of spectrum assignments, 3GPP has standardized 5G NR in the 37-40 GHz band (known as Band n260), and the 40-43.5 GHz range may be added if requested by mobile operators. This standardization effort assists with the development of associated the 5G ecosystem supporting deployments that began in 2020 and have continued in 2021.

We also note that regulators have begun to move forward with the assignment of 40 GHz spectrum. Notably, the United States has already auctioned licenses in the 37.6-38.6 GHz and 38.6-40 GHz ranges, with winning bidders announced in March 2020, including significant assignments to major U.S. mobile carriers.¹ Licensees are permitted to deploy any services permitted under a fixed or mobile allocation.

With the recently concluded 26 GHz spectrum license auction and the planned continuation of the 26 GHz and 28 GHz area-wide apparatus license (AWL) allocation process, as well as growing international interest in deploying IMT services in the 40 GHz band, we support the ACMA's decision to continue to monitor developments related to the 40 GHz band and to continue to consider the appropriate timing for the potential release of the band for use by IMT.

1.3 600 MHz band

There is also significant international momentum behind the use of the 600 MHz for wireless broadband services. The United States auctioned the 600 MHz band in 2017 and awarded the spectrum on a technology-neutral basis. Guatemala and Mexico are slated to auction 600 MHz spectrum in 2021. In March 2021, Hong Kong's Communications Authority announced a decision to auction the 600 MHz band (617 – 652 MHz/663 - 698 MHz) in support of 5G. New Zealand's Ministry of Business, Innovation and Employment indicated in their 2018 Road map to 5G that the 600 MHz band is to be considered for 5G. use.

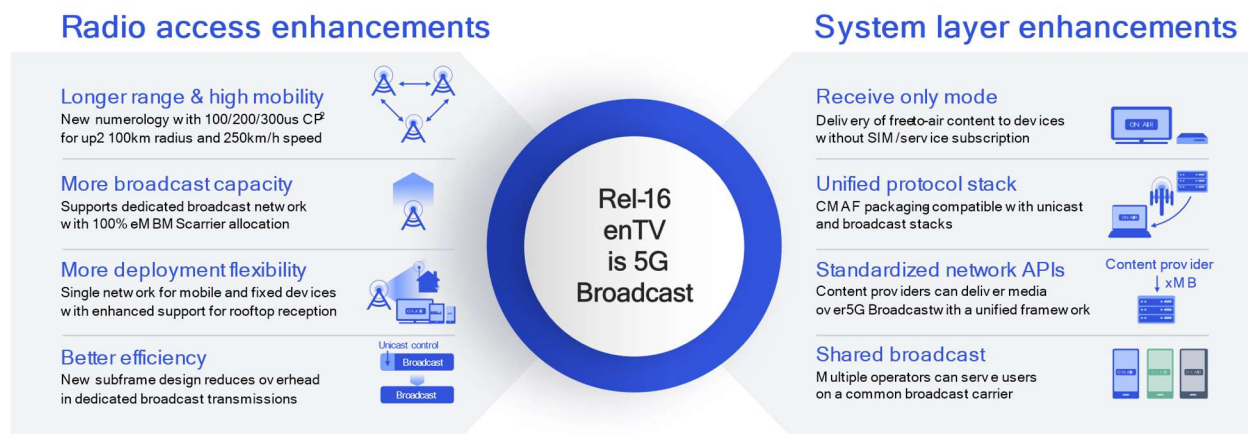
¹ FCC, Auction 103: Spectrum Frontiers – Upper 37 GHz, 39 GHz, and 47 GHz, <https://www.fcc.gov/auction/103/>; FCC, Auction 103 Winning Bidders and Incentive Payments, March 12, 2020, <https://www.fcc.gov/document/auction-103-winning-bidders-and-incentive-payments>.

Similarly, the GSA has identified 37 operators investing in spectrum at 600 MHz (bands 71 and n71) and at least three have launched both LTE and 5G services in this range, and another two have launched 5G services. There are 101 devices announced for use in band 71 and n71, 36.6% of which are smartphones.

Based on the above Qualcomm supports the movement of the 600 MHz band to the initial investigation stage and ongoing ACMA work to develop potential replanning options. We are encouraged by the activities, including the ongoing Media Reform Green Paper proceeding, that are laying the foundation for the potential availability of additional sub-1 GHz spectrum suitable for mobile broadband services. We encourage the ACMA to, as indicated in the Draft FYSO, continue to monitor relevant international developments, and engage with all stakeholders on the appropriate transition path for terrestrial digital television.

Qualcomm is also extensively involved in the development of 5G broadcast technology, which builds on a foundation established in 3GPP Rel. 14 in 2017 and is now part of Rel. 16. The 5G broadcast technology has been standardized as 3GPP TR 36.976 and ETSI JTC Broadcast TS 103 720. For TV broadcasters and content providers, digital television via cellular technology creates an opportunity to broaden their reach; for mobile network operators, it expands their service portfolio by leveraging existing networks and resources; and for consumers, it gives them access to even richer content on their mobile or fixed devices. Moreover, cellular has evolved rapidly in recent years and can deliver much higher efficiencies than other standalone TV broadcast technologies.

Figure 1: 5G broadcast - main technology components



We encourage the ACMA to consider innovative technologies, such as 5G broadcast, when considering appropriate uses and replanning options for the 600 MHz band.

1.4 ITS and the 5.9 GHz band

The current ITS class license supports C-V2X technology and will enable the implementation of this exciting vehicular safety technology in Australia.

1.4.1 C-V2X technology

C-V2X is comprised of two complementary vehicular communications modes: direct mode (C-V2X-Direct), referred to as PC5 in 3GPP specifications, and network mode, referred to as the Uu interface in 3GPP specifications. C-V2X Direct enables cellular communications directly, without connecting to any cellular network and without requiring any network service subscription. C-V2X Direct includes the following: (1) vehicle-to-vehicle (V2V) communications of safety information among nearby vehicles, to ensure smooth travel and prevent collisions; and (2) vehicle-to-roadside infrastructure (V2I) communications, including communications between vehicles and traffic lights, message signs, road alerts, and other roadway information, to enable efficient travel. Augmenting these direct communications are C-V2X's network (V2N) mode, which enables vehicles and roadway infrastructure to communicate more broadly through cellular networks using spectrum outside of the 5.9 GHz band. C-V2X Direct supports critical roadway communications applications that vehicle-resident technologies, such as radar systems and camera-based technologies, are unable to provide, specifically low-latency connections in non-line-of-sight situations around corners and through other vehicles and roadway barriers as well as at night and during bad weather conditions. C-V2X's extended communications range provides more advanced warning of hazards ahead, while its non-line-of-sight communications abilities provide improved safety at intersections and when entering and exiting certain major roadways.

For years, Qualcomm has been actively developing both 4G LTE-based C-V2X for basic safety messages and 5G NR-based advanced C-V2X technologies and simultaneously driving standards efforts with a host of other stakeholders in 3GPP. C-V2X builds on the legacy of roadway safety efforts developing ITS applications, which are now coupled with the countless advancements in 4G and 5G cellular technology. Since 2017, Qualcomm has been collaborating with automotive industry leaders throughout the world to showcase the advantages and capabilities of C-V2X. The outstanding results from these efforts prove that C-V2X is ready for widescale deployments.

1.4.2 C-V2X momentum

C-V2X momentum is picking up around the world, notably in China and the United States. China's investments and focus on bringing C-V2X technology to market, both in-vehicle as well as along roadways, have created a sense of urgency for the market. During the Shanghai Auto Show in April 2020, 13 Chinese automakers (including SAIC, GAC, Dongfeng, Changan, FAW, BAIC, JAC, Great Wall, Southeast, Zotye, Jiangling, BYD, and Yutong) announced plans to integrate C-V2X into mass-produced vehicles from the second half of 2020 to the first half of 2021. Moreover, China allocated spectrum in the 5.9 GHz band supporting the roll-out of C-V2X technology based on 3GPP Release 14/15, showing its commitment to improving driver safety.

Likewise, the U.S. market is embracing C-V2X following the FCC's Report and Order on the use of the 5.9 GHz band (5895-5925 MHz) for the technology.² Ford has announced plans to introduce C-V2X in all of its new vehicles beginning in 2022, subject to a favorable regulatory environment, while Audi of America announced that it would deploy C-V2X on roadways in conjunction with the Virginia Department of

² FCC, FCC Modernizes 5.9 GHz Band to Improve Wi-Fi and Automotive Safety, November 20, 2020, <https://www.fcc.gov/document/fcc-modernizes-59-ghz-band-improve-wi-fi-and-automotive-safety-0>.

Transportation and with American Tower Corporation, which will provide advanced wireless infrastructure.³

1.4.3 C-V2X in Australia

Qualcomm supports the ACMA's intent to ensure that Australia's regulatory framework enables the implementation of C-V2X and looks forward to participating in the upcoming review process planned for 2021-2022.

1.5 6 GHz RLANs

Qualcomm supports the ongoing ACMA activities to re-plan the 6 GHz band to enable usage by unlicensed devices and technologies. We support the expedient replanning of the 5925-7125 MHz range to accommodate the rapidly growing demand for wireless connectivity driven not only by the COVID-19 pandemic but by the steady growth in wireless data consumption across multiple device form factors and service offerings.

Recognizing that the ACMA has recently opened consultation 12/2021 on RLAN use in the 5 GHz and 6 GHz bands, Qualcomm intends to provide more detailed comments on the use of the 6 GHz band in a submission to that proceeding.

1.6 Mid-band spectrum including 3300 - 4200 MHz and 4400 - 5000 MHz

Qualcomm strongly supports the use of 3.3 - 4.2 GHz for mobile services. This band is a key band for 5G deployment, with increasing interest and support from different stakeholders. Based on harmonization developments, including markets in Asia-Pacific, Europe, and the Americas, Qualcomm believes 3.3 – 3.8 GHz will be widely used for mobile broadband and that many of the initial 5G deployments will occur in this band, which is driving the use of its extension in the 3.8-4.2 GHz range.

Furthermore, Spectrum in the 4400-5000 MHz range is of interest for mobile services, and although the market is at an early stage, an increasing number of countries are considering this spectrum for IMT. Sub-bands in the 4400-5000 MHz range have coprimary mobile allocation. At WRC-19 over 40 countries identified some or all of the spectrum in this range for IMT. A few countries (China, Hong Kong SAR, Japan and South Africa) have assigned spectrum in this range already.⁴

Qualcomm encourages the ACMA to release additional spectrum for mobile broadband in the 3.8 – 4.2 GHz and 4.5 – 5.0 GHz ranges.

The mid-band spectrum mentioned in the paragraphs above offers a mix of utility for capacity and coverage. It is especially useful for 5G deployment, bringing the potential to provide a large amount of

³ See, for example, CNET, Ford's cars will start talking to each other in 2022, January 7, 2019, <https://www.cnet.com/roadshow/news/ces-2019-ford-c-v2x/> and Audi of America, Audi collaborates to deploy C-V2X communication technology on Virginia roadways, September 29, 2020, <https://media.audiusa.com/en-us/releases/437>.

⁴ GSA, Snapshot of National Spectrum Positions: Spectrum from 4400 MHz to 5000 MHz, April 2021

contiguous spectrum that will support wide-bandwidth channels, which are ideal for 5G deployment.⁵ The band has been an early focus of 5G development by equipment manufacturers.

As noted in the Draft FYSO, the 3.3 GHz band is the subject of consideration under WRC-23 Agenda Item 1.2 in Regions 1 and 2. No. 5.429, 5.429C and 5.429E of the International Radio Regulations provides an additional allocation to the fixed and mobile services in more than 40 countries globally, many in Region 3. No. 5.429B associates the allocation with an IMT identification for countries in Region 1, No. 5.429D associates the allocation with countries in Region 2, and No. 5.429F associates the band with an IMT identification with countries in Region 3. The band can thus already be used worldwide under specific conditions and WRC-23 studies should bring further global harmonization.

Conversely, Qualcomm also recognizes the current and planned future use of the band by defense and national security users in Australia. Understanding Australia's priorities for the 3.3 GHz band, Qualcomm agrees with the plan indicated in the Draft FYSO to continue to monitor global developments in the band and to continue to consult with the Department of Defense concerning non-defense use of the band.

1.7 Conclusion

Qualcomm is encouraged by the ACMA's continued focus on wireless broadband services and the importance of spectrum arrangements that will enable the deployment of 5G, ITS, and Wi-Fi 6 services in Australia. The ACMA's stated plans and the FYSO process enable all stakeholders to plan for successful wireless technology deployments that deliver enhanced and innovative services to Australian users while maximizing harmonization with global and regional developments.

Qualcomm's systems-level research and ecosystem support efforts are both helping the ecosystem with 5G deployments and contributing to the next evolution of 5G and Wi-Fi. We appreciate the opportunity to provide feedback to the ACMA and would be happy to provide further information that could help the ACMA to further develop its plans.

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

⁵ GSMA, "Considerations for the 3.5 GHz IMT range: getting ready for use," (May 2017), <https://www.gsma.com/spectrum/wp-content/uploads/2017/06/Considerations-for-the-3.5-GHz-IMT-range-v2.pdf>.