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DSA
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Dynamic Spectrum Alliance response to consultation on the ACMA Five-year spectrum outlook 2016-20

Introduction

The Dynamic Spectrum Alliance (DSA) is a global organization advocating for laws and regulations that will lead to more efficient and effective spectrum utilization.[1] The DSA's three goals are closing the digital divide globally, enabling the Internet of Things and alleviating the "spectrum crunch". The DSA is pleased to file a submission in this consultation.

Dynamic spectrum access makes the most efficient and effective use of spectrum that otherwise is being significantly underutilized. Further, dynamic spectrum access provides protection for incumbent services while enabling new sharing opportunities, thus offering potential ways to overcome the seemingly intractable spectrum clearing or grandfathering battles that have defined spectrum management over the last two decades.

The DSA advocates for dynamically shared spectrum and applauds the ACMA for making this topic a focus of its 2016-20 spectrum outlook and seeking views on issues surrounding dynamic spectrum access.

5G

In terms of when it would be appropriate for the ACMA to move beyond 'monitoring' for potential 5G mmW bands in its mobile broadband work program (*question 1*), the best metric would be when there is availability or near-availability of commercial equipment which can operate in this band. This standard is appropriate for all spectrum bands, including those below 6 GHz (in response to question 2). Accordingly, (in response to *questions 3 and 4*), it would be appropriate and not speculative for the ACMA to move beyond monitoring in the 60 GHz band, where there will soon be a range of commercial products able to operate.

Wi-Fi at 60 GHz will have an increasingly significant part to play in distribution of content and access to high bandwidth services given its ability to deliver multi-gigabit speeds, low latency, and security-protected connectivity.

[1] Our membership spans multinationals, small-and medium-sized enterprises, and academic, research, and other organizations from around the world, all working to create innovative solutions that will increase the amount of available spectrum to the benefit of consumers and businesses alike. A full list of DSA members is available on the DSA's website at www.dynamicspectrumalliance.org/members/.

The oxygen absorption characteristics within the 60 GHz band limit the effective signal range and allows for greater frequency reuse. This makes the spectrum well suited for multigigabit wireless personal areas network (WPAN) and wireless local area networks (WLAN) that can operate effectively at distances of 10 meters or more. The IEEE developed and approved amendments to existing standards for license-exempt devices operating in Wireless Local Area Networks (802.11ad) and Personal Area Networks (802.15) in the 60 GHz band. The channel size is 2.16 GHz wide. The Wi-Fi Alliance has created a WiGig certification program to ensure that devices conforming to the 802.11ad standard are interoperable. Wi-Fi-enabled devices will increasingly be able to operate in the 2.4 GHz, 5 GHz, and 60 GHz bands, switching seamlessly between bands, e.g., away from the 60 GHz band to a lower band if the user moves to a different room.

Another important use case for the 60GHz band is wireless broadband access which can provide multigigabit throughput for short to medium distances. The band cannot only be utilized for mobile backhaul to cell towers, but can also act as a "fiber extension" to extend broadband connectivity from existing points of presence (“POPs”) to nearby locations, including access points and small cells. In a dense environment, many links are expected to operate in close proximity. Again, because of the high rate of oxygen absorption and corresponding signal attenuation, which naturally mitigates interference, regulators are moving forward with a license-exempt framework for the 60 GHz band, for both outdoor and indoor applications.

The ACMA should therefore consider how this band could be made available for 5G uses in ways appropriate to Australia’s market and spectrum plan in order to enable Australian consumers and businesses to benefit as soon as possible from the clear and substantial gains that will be provided by the increased capacity of 5G technologies. The ACMA notes the potential for “trials in appropriately chosen bands and locations” and the ACMA should engage with national and multinational industry players to encourage and facilitate such trials.

Sharing leads to better spectrum utilization and this can be done without harming incumbent users. Indeed, effective sharing enables more intensive of use of spectrum while protecting existing users from harmful interference. Moving back to discussion of all 5G mmW bands, the ACMA seeks views (*questions 6 and 7*) about spectrum sharing and incumbency considerations in relation to these bands. An important consideration when looking to enable sharing is to protect existing users and a sharing framework that the ACMA should look to for the 5G mmW bands is the three-tier model being used in the US for sharing in the 3.5 GHz band. This builds on existing database-based spectrum sharing frameworks and allows three tiers of users to share 150 MHz of spectrum in the 3.5 GHz band through a software-based spectrum access system. The model protects co-primary incumbents and new entrants while also providing general authorization for spectrum which is not being used, thereby introducing the potential for license-exempt use.

IoT

IoT has largely developed using unlicensed spectrum, which has incentivized the deployment of the network infrastructure on which IoT devices rely. This spectrum is ideal for many IoT devices, which tend to transmit more episodically, transmitting small bursts of data rather than maintaining continuous, high-speed data streams. As the ACMA states in its outlook, IoT applications are already successfully sharing spectrum that is already licensed for other uses, such as existing cellular networks. To enable this burgeoning sector to keep developing, the ACMA needs to continue to provide unlicensed spectrum for IoT devices, enabling sharing wherever possible.

In particular, the ACMA should investigate how it can make use of VHF and UHF spectrum for IoT through license-exempt access and dynamically shared access. Frequencies in the VHF and UHF bands, particularly where there are TV White Spaces, will be very important for a number of IoT applications. This is because of the favorable propagation characteristics of these lower frequencies both for remote and rural areas where infrastructure tends to be sparser and connectivity challenges are greater, and for home and office applications where the lower frequencies have a relatively greater ability to travel through floors and walls. The variable bandwidth capabilities enabled by these characteristics make the UHF bands valuable for a number of IoT applications and therefore the use of spectrum sharing by White Space devices in these bands which be an important enabler for continued development of the IoT.

Dynamic Spectrum Access

Dynamic spectrum access (DSA) is not a single approach, but rather a collection of techniques and technologies which enable the sharing of spectrum dynamically. Depending on the specific requirements for protecting the licensed services in a given frequency band from harmful interference, dynamic spectrum sharing can utilize a combination of technologies, including but not limited to geo-location databases, access control technologies, sensing, and data analytics to allocate the available spectrum in the most efficient manner.

As noted by the ACMA (page 28), dynamic sharing respects the Spectrum Management Principle of “balancing the cost of interference and the benefits of greater spectrum utilization”. We welcome the ACMA’s advocacy of spectrum sharing and its openness to the opportunities afforded by dynamic spectrum access.

As noted by the Director of the ITU Radiocommunication Bureau in 2013, application of DSA techniques can be accommodated by the international regulatory framework and is something which regulators can move forward to take advantage of.[2] In response to

[2] *“The ITU World Radiocommunication Conference of 2012 concluded that the current international regulatory framework can accommodate software defined radio and cognitive radio systems, hence*

Question 10, it is already appropriate to move beyond monitoring of international developments and towards implementation in Australia.

For example, Dynamic Frequency Selection (DFS) is a DSA technique that protects incumbent users of military radar and Doppler weather radar and is currently being used in Australia by LIPD Class License devices accessing the 5250-5350 MHz, 5470-5600 MHz and 5650-5725 MHz bands.[3]
The time is therefore ripe for the ACMA to develop regulatory frameworks to facilitate spectrum sharing through DSA for other spectrum bands, following the examples of many other regulators.

The ACMA should target the VHF / UHF bands and the 3.4-3.8 GHz bands for trials and initial implementation in Australia:

- As noted in the ACMA's 2016-20 outlook, DSA frameworks have been put in place to make use of **TV White Spaces** in the UK and US, allowing for the sharing of spectrum between broadcasting, PMSE and Wi-Fi in the UHF bands. Regulations have also been adopted in Singapore and Canada, with draft regulations being considered in countries including Colombia, Ghana, Malawi, the Philippines, South Africa and South Korea.

  In addition, there have been a number of highly successful pilot trials in many countries, which have helped to demonstrate that TVWS technology works without causing harmful interference to incumbent services; these include Botswana, Colombia, Cote d'Ivoire, Ghana, India, Indonesia, Jamaica, Japan, Kenya, Morocco, Nigeria, the Philippines and Tanzania. The ACMA should therefore look to open up the VHF and UHF bands in Australia to such sharing.

- The ACMA also references the DSA framework developed for **the 3550-3700 MHz band** in the US, where rules allow for licensed and unlicensed operations side-by-side though DSA databases and network detection. This is a good example to investigate as it has already resulted in trials by Google Fiber to transmit superfast broadband over this spectrum in a number of US cities and the development of standards and protocols for spectrum sharing in this band through the Wireless Innovation Forum industry alliance. The ACMA could consider such an arrangement for the **3.4-3.8 GHz band** to maximize use of this spectrum in Australia.

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dynamic spectrum access, without being changed. The development of systems implementing this concept, such as TV white spaces, is therefore essentially in the hands of national regulators in each country". François Rancy, Director, ITU Radiocommunication Bureau, ITU Radiocommunication Seminar for Arab Countries, RRS13-Arab Tunis, Tunisia on December 13, 2013

[3] Radiocommunications (Low Interference Potential Devices) Class Licence 2015, https://www.legislation.gov.au/Details/F2015L01438

More intensive dynamic spectrum sharing should be a key regulatory objective, enabling regulators to accommodate varying demands of different uses. Proactive engagement by the ACMA will be a critical factor in the success of dynamic spectrum sharing in Australia. In general, while market mechanisms can develop the technology to improve sharing, regulators have an important role to play in facilitating the development of sharing regimes.

The ACMA can facilitate dialogue regarding the minimization of interference risks associated with coexistence and aligning incentives among existing and new users to encourage them to participate actively in developing spectrum sharing frameworks.

The ACMA can also help by providing signals and certainty which will encourage the development of markets for the devices and infrastructure needed to take advantage of dynamic spectrum sharing. This includes certainty about the availability and particular properties of spectrum, as well as ensuring that the sharing can happen in both rural and urban areas. This is because nationwide markets are needed for these new technologies to achieve the economies of scale which will provide necessary commercial incentives and drive down the costs of devices. Without a strong signal that dynamic access will be a key part of its policy regime, the industry will be unable to commit to the investment necessary to drive new innovations in this space.