

Cambium Networks

Proposed Changes to the LIPD for 6GHz RLAN Consultation Paper. Nov 2021

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1. EXECUTIVE SUMMARY

The Cambium Networks team covering Australia, New Zealand and the Pacific Islands, appreciates the opportunity to submit a response to the consultation paper for the *“Proposed Changes to the LIPD for 6GHz RLAN”*.

Cambium Networks empowers millions of people with wireless connectivity worldwide. Our wireless portfolio is used by commercial and government network operators as well as broadband service providers to connect people, places and things. With a single network architecture spanning fixed wireless and Wi-Fi, Cambium Networks enables operators to achieve maximum performance with minimal spectrum. End-to-end cloud management transforms networks into dynamic environments that evolve to meet changing needs with minimal physical human intervention. Cambium Networks empowers a growing ecosystem of partners who design and deliver gigabit wireless solutions that just work.

Cambium Networks is committed to supporting Wi-Fi 6E standard and will start to deliver products that will support the extended WiFi 6GHz band towards the end of this year (2021). We will start to shipping Wi-Fi APs and then in 2022 follow with Fixed Wireless products that will be able to use this band. We are excited that the ACMA has plans to make the lower 500 MHz of this band available in Australia for WiFi (LIPD) and has also opened the consultation for the broader use of the entire 1200 MHz of the band for WiFi and also use of the band for outdoor Wireless Broadband (WBB) or Fixed Wireless as we refer to this technology.

Vision for a 6 GHz Wireless Fabric (WBB)



Wi-Fi (2H 2021)

- Tri-Band
- Software Defined Radio
- Investment Protection



PMP 450 FWBB (1H 2022)

- Dual band
- 2 Carrier Aggregation
- Path to Fixed 5G



ePMP FWBB (1H 2022)

- MU-MIMO
- 4096 QAM, 20/40/80/160 MHz Channels
- GB Fixed Wireless Broadband Access

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2. INTRODUCTION

2.1. INTRODUCTION TO CAMBIUM NETWORKS

At Cambium Networks, we support the communications of life for millions of people around the world and connect enterprise networks where other options cannot. No matter what the conditions or locations, wherever people or networks need to be connected, our wireless broadband solutions deliver clear voice, data and video communications people and networks can rely on.

Our Mission is Connecting the Unconnected and delivering solutions and technology that Bridge the Digital Divide.

Cambium Networks provides professional grade fixed wireless broadband, microwave, narrowband IoT and Enterprise indoor and outdoor Wi-Fi networks. Our solutions are deployed in tens of thousands of networks in over 150 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding performance metrics. To date Cambium Networks has delivered over ten million radio devices, a count that continues to accelerate year-over-year.

Cambium Networks are proven, respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice, and video connectivity solutions, through a qualified channel of distributors, Wireless Internet Service Providers, Telecommunications Companies, Value Added Resellers and System Integrators. Our solutions enable and ensure the communications of life, empowering personal, commercial, and community growth virtually everywhere in the world.

Indoor and outdoor Enterprise Wi-Fi technology from Cambium Networks is used in K12 and higher education, MDU, hospitality, large public venues, public Wi-Fi hotspots, retail, warehousing, and enterprise networks. Following ten-years as a business unit within Motorola Solutions, Inc. Cambium Networks was established in 2011 following divestiture from Motorola Solutions.

2.2. WHAT IS FIXED WIRELESS?

Key to understanding the value of the Fixed Wireless portfolio, is understanding how it is different from and should not be confused with Mobile Broadband (MBB).

Mobile Broadband is synonymous with the networks that support mobile UE and are designed and built with that in mind.

Whilst similar in many respects, our Fixed Wireless broadband solutions, are optimised to provide the best results for delivery of fixed data services using harmonized RF bands. The typical application for Fixed Wireless is to provide a fixed data service using RF, when the use of fiber or copper are not possible, suitable, available or affordable.

Mobile Broadband provides data connectivity for mobile User Devices whilst Fixed Wireless Broadband (FWBB) connectivity to a site where a fixed installation module (SM) is installed. The SM uses Gigabit Ethernet to connect to inside Ethernet switches or directly to a Wi-Fi access point. In a FWBB network, the client devices connect to broadband via Ethernet or Wi-Fi edge technology.

3. ISSUES FOR COMMENT

3.1. LOWER 6 GHZ BAND/PROPOSED UPDATE TO THE LIPD CLASS LICENCE

3.1.1. 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?

Yes, Cambium Networks confirms these are sufficient.

3.1.2. 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-UNLICENCED (NR-U) SERVICES? IF SO, IS THE PROPOSED CONDITION, AND THE LANGUAGE USED TO EXPRESS IT, APPROPRIATE

Yes, we believe that implementation of contention-based protocols will provide for a reasonable method of sharing spectrum. Language used is also appropriate.

3.1. ARE THERE ANY BROADER COMMENTS ON THE PROPOSED UPDATE TO THE LIPD CLASS LICENCE?

The entire 6GHz band, both lower and upper ie 1200MHz is being supported in the US by the FCC and a number of other countries around the world, including USA, Brazil, South Korea, Saudi Arabia are supporting the full band, and CEPT has also just commission of program of works to explore extending WiFi use to the upper band. WiFi Technology from Cambium will support the full Wi-Fi 6E band and we encourage ACMA to give strong consideration to adding the upper band to the LIPD Class License for both WiFi and BWA use.

3.2.UPPER 6 GHZ BAND/HIGHER POWER RLAN DEVICES

3.2.1. SHOULD THE ACMA MAKE ARRANGEMENTS THAT PERMIT HIGH-GAIN DIRECTIONAL ANTENNAS (FOR EXAMPLE, FOR WISPS IN REMOTE AREAS) UNDER A CLASS LICENSING REGIME?

Yes, we support this. High-gain directional antennas enable long point-to-point links, which are especially necessary in remote areas. Without high-gain antennas, sparse deployments may require too many access points to reach all subscribers, or multiple links to form a longer point-to-point link. Both solutions may not be economically viable, therefore preventing effective service in remote areas. With high-gain antennas the transmitter EIRP is increased, but these antennas have small beamwidth, so the potential interference is limited to a small area in the direction of the transmission. Also, high-gain directional antennas add benefits on the receive side, as they amplify the received signal without creating any additional interference in the system.

3.2.2. IF 'HIGH POWER' CLASS-LICENSED DEVICES WERE TO BE INTRODUCED UNDER AN AFC SYSTEM:

Cambium Networks is designing products in our ePMP Range (ePMP4000) and PMP450 range that will support the entire 6 GHz (1200 MHz) is spectrum. We fully support the allocation of both the lower 500 MHz (5925-6425 MHz) and the upper 700 MHz (6425-7125 MHz) for outdoor Fixed Wireless (BWA) applications, both PMP and PTP.

3.2.2.1. IS THERE INTEREST FROM INDUSTRY IN ADMINISTERING SUCH A SYSTEM?

In the US there is definitely interest. Various providers have already submitted a form of intent to the FCC or plan to. These include Google, Federated Wireless, CommScope, and Qualcomm, among others. Once the AFC system is in place in the US, if the operational requirements are similar in Australia, it is likely that many vendors will extend their support to Australia.

Cambium Networks already works with these companies who host SAS for CBRS and would also work with them to ensure our Fixed Wireless products in this band will work with the AFC Systems.

3.2.2.2. 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?

There are three aspects an AFC provider needs to consider.

The first is the access to the incumbent database to protect operation of existing devices. The FCC database needs to be updated to clean up missing and incorrect information, and data organized in a way that is easy for AFC vendors to retrieve. If the Australia database were re-organized to include the same information and provide the same interface, this would increase the probability that AFC vendors in the US would extend operation in Australia, as it would require minimum additional work.

The second is the terrain information for the potential interference calculation to the incumbents. Data needs to be provided for all covered Australia regions, ideally with the same level of resolution available in the US.

The third one is the math to calculate potential interference to incumbents, channel availability and maximum EIRP each device can use. This is explicitly defined by standards bodies and can be reused as-is for operation in Australia.

3.2.2.3. 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?

The closer the Australian system is to those implemented elsewhere, the easier it would be for AFC vendor to extend their operation in Australia. Customization could be considered if there is a class of incumbents that for some reason needs more or less protection from other devices. If the level of protection afforded by the calculations in the AFC deployed elsewhere is sufficient for operation by the Australian incumbents, then changes are not necessary.

3.2.2.4. WHAT ASPECTS OF AN AFC SYSTEM WOULD NEED TO BE CONSIDERED IN THE DESIGN, ESTABLISHMENT, AND ONGOING OPERATION, OF SUCH A SYSTEM, INCLUDING:

3.2.2.4.1. REGULATOR AND INDUSTRY COMMITMENTS

3.2.2.4.2. TECHNICAL SPECTRUM COORDINATION AND COEXISTENCE RULES – FOR EXAMPLE, A TIERED HIERARCHY FRAMEWORK FOR SPECTRUM USES

3.2.2.4.3. IT INFRASTRUCTURE AND SYSTEM DESIGN, INCLUDING SECURITY AND SYSTEM RELIABILITY ISSUES

3.2.2.4.4. COMMUNICATION INTERFACES BETWEEN AN AFC SYSTEM, THE ACMA'S REGISTER OF RADIOCOMMUNICATIONS LICENCES (RRL) AND DEVICES

3.2.2.4.5. ONGOING INTERACTION BETWEEN THE ACMA AND SYSTEM OPERATORS

Most of the design and operation requirements AFC systems must follow in other countries can be reused in Australia for simplicity. However, additional information can be added to make the AFC operation more efficient. For example, the current requirements do not include the antenna beamwidth among the information a device registering with the AFC needs to provide. This means that calculations are done assuming an omnidirectional antenna. This may not always reflect the actual deployment, and in fixed wireless it results in a very pessimistic estimate of the potential interference. The higher the antenna gain the smaller the beamwidth, and therefore there is a smaller probability the device would interfere with an incumbent. However, assuming the antenna is omnidirectional applies the same restrictions in all possible direction, resulting in a much higher probability the device will be denied operation on the channel or its EIRP will be reduced. This makes the whole ecosystem less efficient and tends to crowd channels not used by the incumbents, where channels used by the incumbents far enough from the incumbent location would have been usable.

Even if the AFC system is designed to only provide channel availability and EIRP limits, there is an opportunity for more advanced features to be provided by the AFC system, like channel coordination among devices, channel quality reports, etc., which help the operator in managing a more efficient network.

3.3. 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?

A manual registration process can always be supported, even if it is obviously more time consuming than an automatic registration. The accuracy of the data entered manually may be a concern. The possibility of purchasing licenses for certain geographic areas for certain channels may be beneficial, as operators would have guaranteed spectrum and not having to share it with other operators. If licenses become available per each geographic area, it would still be necessary to have some channels open to operation for all devices, so that operators without licenses would still be allowed to operate everywhere, but they would have to handle the interference in the unlicensed spectrum.

3.4. 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?

Yes, as is done with other bands, treatment for high, medium and low density could make sense. We note however there are no differences for 5 GHz class licensed spectrum currently.

3.5. ARE THERE ADDITIONAL SHARING SCENARIOS AND/OR STUDIES RELEVANT TO THIS BAND THAT HAVE NOT BEEN IDENTIFIED IN THIS PAPER?

Cambium Networks see value in the full 6GHz band ie 1200Mhz of spectrum for both WiFi and BWA (Fixed Wireless). Cambium is developing products to use the band for both. The opportunity and innovation that this presents the market is key and should be adopted in Australia.

4. FURTHER CONSIDERATIONS FOR THE 5 GHZ BAND

Other preferences for updates to the 5 GHz band expressed during the consultation for this band included:

- following the regulations in place in the US, which allow a maximum power in 5150–5250 MHz of 4 W EIRP (rather than 1 W)
- allowing outdoor operation in the existing indoor-only 5250–5350 MHz range
- increasing PSD limits in 5150–5350 MHz from 10 dBm to 11 dBm.

4.2. 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 ABOVE?

Cambium fully supports extending the utility of the 5 GHz by allowing operation between 5150-5250 MHz and 5250-5350 MHz. The 4W EIRP maximum will also greatly increase delivery of outdoor fixed wireless by improving system gain, RF availability and Subscriber coverage in LOS, nLOS and NLOS applications.

4.3. IF OUTDOOR AND/OR HIGHER POWER RLAN DEVICES WERE AUTHORISED 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)?

We don't believe this is necessary. Consistent with other regulatory domains, this new outdoor band (5150-5250 MHz) can be regulated based EIRP and spectral density requirements/limitations. There are no other services being shared that will conflict with this band. Perhaps a light licensing model will suffice for this band in Australia.

4.4. IF HIGH POWER DEVICES WERE TO BE AUTHORISED IN BOTH THE 5 GHZ AND 6 GHZ BAND, WOULD IT BE APPROPRIATE TO USE THE REGISTRATION/AUTHORISATION METHOD AND SYSTEM FOR BOTH?

Since there are existing incumbent services, an AFC system may be more suited toward the 6 GHz band. It may not be necessary to impose a registration/authorisation system on the 5 GHz (5150-5350 MHz) band since this is already existing, albeit for indoor use only.