Cambium Networks

3.3 GHz use in New Zealand

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1 EXECUTIVE SUMMARY

The Cambium Networks team covering Australian, New Zealand and the Pacific Islands, appreciates the opportunity to submit a response to the *Discussion document, 3GHz in Regional New Zealand*.

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 excited about the plan to make 3.3GHz to 3.4GHz available for Fixed Wireless Broadband in the Regional and Rural NZ. Similar spectrum has proven its value in the US, in the CBRS band (3.6GHz) where Cambium now has over 100,000 SMs implemented. Having licensed spectrum is valuable for WISPs to deliver reliable high-speed broadband, for service providers to deliver innovative connectivity solutions, and for SIs to deliver effective IoT solutions, SMART City communications including CCTV and Wi-Fi backhaul and also effective ITS communication infrastructure. The 3.6GHz band is still available in remote locations in Australia, that were not included in the spectrum auctions and is being effectively used by service providers to provide reliable Fixed Wireless communications. The 3GHz spectrum has also proven very effective for long range rural communications so important in NZ, with excellent propagation capability for communication in nLOS conditions. We strongly applaud the planned move by the RSM to make additional licensed spectrum available for Fixed Wireless Broadband.

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 divesture 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.

Fixed Wireless Broadband Introduction. https://www.youtube.com/watch?v=YcCoJjs58Rg

3 RESPONSE TO QUESTIONS SPECIFIC TO OPTIONS PRESENTED.

3.1 Q1. DO YOU AGREE THAT THE 10 MHZ BETWEEN 3.40 – 3.41 GHZ SHOULD BE INCLUDED WITH THE 3.41 - 3.80 GHZ BAND (THE 3.5 GHZ BAND) THAT WILL BE MADE AVAILABLE FOR NATIONAL USE?

Yes, Cambium supports this approach.

3.2 Q2. WHAT IS YOUR VIEW ON USING THE 3.3 - 3.4 GHZ BAND FOR REGIONAL BROADBAND AND/OR PRIVATE NETWORKS? ARE THERE OTHER USE CASES OF THIS BAND THAT SHOULD BE CONSIDERED?

Cambium Networks fully supports the use of this band for regional broadband and/or private networks. The discussion document describes the need and use cases well. Proven use cases in Australia for the 3.6GHz band before it was allocated and auctioned for 5G and some ongoing regional and remote networks, includes CCTV and Wi-Fi backhaul for Smart Cities, ITS backhaul, backhaul for LTE and Mesh supporting autonomous mining.

The WISP and private network use case are 100% valid and will add significant value to the NZ economy. It is very important to have licensed spectrum for both Regional Broadband (WISP) and Private Network use and this 100MHz will enable valuable communications infrastructure to be built. This 100MHz of licensed spectrum is a great start and it is encouraging that RSM has recognised the importance of having non-national/spectrum license for these applications.

3.3 Q3. DO YOU AGREE WITH OUR ASSESSMENT OF CURRENT SPECTRUM USE AND POTENTIAL IMPACTS?

Yes, we agree.

3.4 Q4. DO YOU AGREE WITH THE ASSESSMENT THAT REGIONAL AND LOCAL USE WILL NOT BE ABLE TO CO-EXIST IN THE SAME GEOGRAPHIC AREA ON THE SAME FREQUENCY? IF NOT, WHY?

There would need to be sufficient studies presented to prove that co-existence on the same frequency will not impact services. Studies to determine propagation losses and channel model will provide a good assessment.

It could be possible however to co-ordinate regional (WISP Fixed Wireless Broadband) and local (Private Network – eg Smart City Wi-Fi and CCTV Backhaul) in the same geographic area by planning and allocation of parts of the 100MHz that will be available.

3.5 Q5. DO YOU AGREE THAT BOTH REGIONAL AND INDOOR USE AS WELL AS LOCAL AND INDOOR USE COULD BE MANAGEABLE IN THE SAME GEOGRAPHIC AREA ON THE SAME FREQUENCY? IF NOT, WHY?

Today, in the GURL 5GHz band we see Wi-Fi being used internally and FW PMP/PTP being used for regional or local outdoor use. So, it could be manageable, BUT we would encourage the 3.3-3.4 band to be allocated primarily for outdoor Fixed Wireless use for both Regional and Local applications. The are many other options for indoor use including 2.4GHz, 5.1, 5.2GHz, 5.7/5.8GHz and the potential 6E band (5925 MHz – 7125 MHz).

3.6 Q6. DO YOU AGREE THAT THE MOST EFFECTIVE WAY TO MANAGE SPECTRUM IN THIS BAND IS TO HAVE CONTIGUOUS SERVICES WITH A COMMON FRAME STRUCTURE AND TIMING (SYNCHRONISATION)? IF NOT, WHY NOT?

Synchronisation is important in managing spectrum. We agree. This is also important to allow for scalable, high-density operations to maximise capacities and deliver broadband services.

Using a GPS timing reference we completely support TDD synchronization. Also, flexibility in the frame-start and duty cycle is important here. This synchronization is straightforward, and we know how to achieve that.

The Cambium FPGA, used in our PMP450i and PMP450m 3GHz products, supports a flexible frame structure that can provide coexistence with LTE and 5G where coordination is required. Today we support the ability to co-locate with LTE services and soon we will support 5G co-location.

Whilst having a common frame structure is certainly not required to manage spectrum in this band, it will allow for co-location and further interference mitigation.

Some details eventually would need to be further clarified and part of this consultation perhaps. For instance, the process for the frame structure selection. Will operators be provided a list of allowed frame structures to choose from? How is a frame structure selected for an entire area?

We believe that further consultation is required to determine the best strategy for frame structure selection. How is this done in other bands? Has the strategy been that that the first operator to deploy is free to choose what they want, and everybody else needs to adjust their frame? Has this approached worked in the past?

A question that may arises is, what if an operator only installs a few devices, and another operator later installs thousands of devices. Would the second operator be able to request a change of frame structure? Being forced to follow what the first operator chose may be suboptimal.

3.7 Q7. WHAT ARE YOUR PREFERRED OPTIONS FOR A BAND PLAN FOR THE 3.3 - 3.4 GHZ BAND? ARE THERE OTHER OPTIONS WE SHOULD CONSIDER, IF SO, PLEASE EXPLAIN WHAT THESE ARE?

We strongly advocate for allocation for Regional and Local Outdoor Fixed Wireless Broadband applications use. The Cambium Networks PMP450i and PMP450m support this band and are ideal products designed to deliver reliable and spectrally efficient fixed wireless broadband communications and also to provide on option for licensed band fixed wireless communications for industrial and Smart City applications. The PMP450m supports Massive Multi-User MIMO and also beam forming, which increases spectral efficiency 2 to 3 times and also add to the overall system link budget.

3.8 Q8. HOW MUCH SPECTRUM IS REQUIRED FOR REGIONAL AND USES AND HOW MUCH IS NEEDED FOR LOCAL USE?

Given the spectrum is going to made available geographically and not licensed nationally the spectrum can be equally used, co-ordinated and allocated for both Regional and Local use. The concept of Area Wide Licenses can be applied similar to what ACMA are doing in Australia ie. allocation based on defined block areas.

3.9 Q9. WHAT EQUIPMENT OPTIONS AND STANDARDS SHOULD WE CONSIDER FOR THE 3.3 GHZ BAND?

Cambium Networks suggests that equipment that supports a TDD frame structure, for Fixed Wireless Broadband be allocated. This could be LTE (3GPP), 5G or non-standard based PMP equipment, but that has suitable TDD frame structure.

Cambium Networks PMP450i (2x2 MIMO) OFDM Fixed Wireless and PMP450m 8x8 Massive MU-MIMO 3GHz solution will both be ideal for this band.

Specifically, the PMP450m that supports Massive Multi-User MIMO and can support up to 4 simultaneous 2x2 MIMO “conversations” provides market leading spectral efficiency and is very well suited for Regional/Rural Service providers.

3.10 Q10. IF WE ADOPT MULTIPLE STANDARDS, HOW SHOULD WE MANAGE INTERFERENCE ISSUES WHILE MINIMISING INEFFICIENT USE OF SPECTRUM?

Cambium suggests that equipment is all TDD frame based to minimise interference and maximise efficient use of spectrum. TDD synchronization/timing and a common flexible/configurable frame structure requirement needs to be adopted.

Further, it is important that unwanted emission limits be developed and/or guard bands. Preferable that reasonable emission limits are used so that guard bands can be avoided to maximise available spectrum. Whatever emission limits are adopted, should be reasonable, not overly stringent and not

add unwanted burden in terms of filtering (for example). Equally important is to ensure that these emissions limits are not too relaxed where they contribute unwanted interference.

3.11 Q11. DO YOU AGREE THAT WE SHOULD SEEK TO PERMIT ALL THREE USE CASES, INDOOR, LOCAL AND REGIONAL USES IN THE 3.3 GHZ BAND? DO YOU AGREE WITH OUR MIX OF USE? IF NOT WHICH CASES SHOULD WE PERMIT?

Cambium suggests the primary use cases should be local and regional outdoor Fixed Wireless Access. Indoor use cases are perfectly suited to the existing Wi-Fi bands and the expected 6GHz band being considered for WiFi and possible GURL BWA applications.

3.12 Q12. WHAT AUTHORISATION MECHANISMS SHOULD WE USE FOR INDOOR, LOCAL AND REGIONAL USE CASES NON-NATIONAL ACCESS IN THE 3.3 – 3.4 GHZ BAND? ARE THERE ANY OTHER MECHANISMS THAT SHOULD BE CONSIDERED?

Cambium does not suggest allocation for indoor use. A mechanism similar to that used in CBRS in the US, for Dynamic Spectrum Allocation could be applied for local and regional use cases. The one nice aspects of this model is that it is a pay as you go model, rather than a large up front license fee. Federated Wireless, Commscope and Google all have Spectrum Allocation Service products (SAS) that could be applied.

3.13 Q13. WHAT SORT OF RULES SHOULD BE APPLIED TO THE AUTHORISATION MECHANISMS TO ENSURE COMPATIBILITY AND FAIR ACCESS?

This is a topic for debate and discussion with local communities but perhaps if allocation is made based on the grid of defined blocks then a mechanism for ensuring use could be applied. If non use is detected in the contract timeframe then it can be withdrawn. Allocation should also ensure access for local WISPs in each of their defined areas of coverage.

3.14 Q14. HOW SHOULD WE PREVENT SPECTRUM DENIAL / HOARDING/ SPECULATING OF LICENSES? SHOULD WE ADOPT ONE OF THE EXISTING MODELS THAT RSM ALREADY EMPLOYS OR WHAT NEW MODEL SHOULD WE USE IN THE 3.3 GHZ BAND?

Cambium strongly supports a process or rule that prevents denial/hoarding or speculating of licenses. We suggest at the time of application the use case is defined and the expected timeframe of use is also requested and set. This should then be policed and a use it or lose it process/policy applied. The key is to ensure availability and use for the intended market and applications.