Huawei Technologies (New Zealand) Company Limited

Submission to RSM's Public Consultation
"3.3 GHz Regional & non-national use in New Zealand Discussion Document August 2021"

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Radio Spectrum Management Policy and Planning

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Re: RSM "3.3 GHz Regional & non-national use in New Zealand Discussion document August 2021"

Huawei Technologies (New Zealand) Company Limited (referred to as Huawei NZ in the rest of this paper) welcomes the opportunity to respond to RSM "3.3 GHz Regional & non-national use in New Zealand Discussion document August 2021" (referred to as the *RSM Discussion Document* in the rest of this document) released in August 2021.

Founded in 1987, Huawei is a leading global provider of information and communications technology (ICT) infrastructure and smart devices. Huawei has more than 197,000 employees and operates in more than 170 countries and regions, serving more than three billion people around the world. Huawei Technologies (New Zealand) Company Limited is a subsidiary of Huawei in New Zealand.

Huawei's vision and mission is to bring digital to every person, home and organisation for a fully connected, intelligent world. To this end, Huawei will drive ubiquitous connectivity and promote equal access to networks; bring cloud and artificial intelligence to all four corners of the earth to provide superior computing power where you need it, when you need it; build digital platforms to help all industries and organisations become more agile, efficient, and dynamic; redefine user experience with AI, making it more personalised for people in all aspects of their life, whether they're at home, in the office, or on the go. For more information, please visit Huawei online at www.huawei.com.

Huawei combines the power of 5G with cutting-edge technologies, such as network slicing and edge computing, developing the 5G Virtual Private Network solution which was acknowledged for its future-forward design, innovation, and successful application by world leading ICT service providers. Recently Huawei's intelligent cloud-network solution has passed the rigorous test administered by EANTC in Berlin,

Germany, an internationally recognised independent test centre, and all test indicators approve the solution is ready for commercial use.

In line with its vision and mission, to bring digital to every person, home and organisation for a fully connected, intelligent world - Huawei NZ welcomes any opportunities to help and bridge the digital divide and enable business agility in rural and regional areas of New Zealand.

Executive Summary

In this submission, Huawei NZ responds to a number of questions raised in the RSM Discussion Document. Following ongoing deliberations with its global affiliates and rigorous analysis of the local environment, Huawei NZ submits the following recommendation for RSM's consideration.

Huawei NZ welcomes RSM's proposal of allocating 3.40-3.41GHz for national cellular mobile services. Huawei NZ also welcomes RSM's generous allocation proposal of the 100MHz bandwidth of 3.3-3.4GHz spectrum to foster the innovative use of this spectrum.

The 3.3-3.4GHZ spectrum has been identified for the IMT (International Mobile Telecommunications) system by many member countries across all the three Regions of the International Telecommunication Union (ITU). This spectrum has been defined by The 3rd Generation Partnership Project (3GPP) as Band 52 for the LTE (a.k.a. 4G) technology and a part of Band n78 (3.3-3.8GHz) for the 5G New Radio (NR) technology. Huawei has observed a proliferation of equipment, on both network side and terminal side, being produced to operate on this spectrum in compliance with the 3GPP standards. This suggests that LTE or NR will also become the mainstream technologies for deployment over 3.3-3.8GHz in New Zealand.

Both Band 52 and Band n78 are Time Division Duplex (TDD) bands. Should such TDD band(s) be adopted, the most efficient way of using the 3.3-3.8GHz spectrum in New Zealand where 3.3-3.4GHz and 3.4-3.8GHz are tentatively allocated for regional/local and national operators, respectively, is to achieve the synchronisation among their radio access networks (RAN). In case synchronisation cannot be achieved amongst regional, local, or national operators, interference mitigations become necessary in between adjacent frequency spectrums. Huawei NZ encourages all the future players to achieve RAN synchronisation.

Both LTE and NR can be used to deploy services, such as fixed wireless broadband and non-public network access, on the 3.3-3.4GHz spectrum. The relevant solutions, including hardware and software, provided by Huawei have been commercially deployed around the world to achieve this. If the allocation of this spectrum will enable the deployment of fixed wireless broadband in rural areas, it can help to bridge the digital divide and improve business agility in those areas.

In this submission, Huawei NZ presents in details the high level benefits and dependencies of LTE and 5G NR for the players to consider in determining the technology adoption.

The above summary is addressed to Radio Spectrum Management New Zealand.

Huawei Technologies (New Zealand) Company Limited

August 2021

Huawei NZ provides details below in responding to some of the questions raised in the RSM Discussion Document. A reference list is provided at the end of this paper.

Q1. Do you agree that the 10 MHz between 3.40 – 3.41 GHz should be included with the 3.4 - 3.8 GHz band (the 3.5 GHz band) that will be made available for national use?

Huawei NZ welcomes RSM's proposal of allocating 3.40-3.41MHz for national cellular mobile services.

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?

Huawei NZ shares with RSM our knowledge of the use of this spectrum around the world.

RSM pointed out that the 3.30-3.40GHz spectrum has been considered for the IMT (International Mobile Telecommunications) system in Region 2, Region 3 and a part of Region 1 of the International Telecommunication Union (ITU).

A considerable number of countries in the Middle East and Africa, the Americas, and Asia-Pacific have allocated or been planning the assignment of the 3.30-3.40GHz spectrum [1]. Amongst these countries, some have assigned this range for nation-wide IMT use, such as China and the Philippines, whilst others are yet to determine the properties of spectrum use, e.g., nation-wide or regional, mobile or Fixed Wireless Access (FWA), public or non-public, etc [1].

In China, 3.30-3.40GHz is shared by three mobile network operators (MNOs), i.e., China Unicom, China Telecom, and China Broadcasting Network Corporation Ltd (CBN). This spectrum is being planned primarily for indoor use and scenarios, as such airports, stadiums, and campuses, to provide capacity relief. Also, in China, the use of this spectrum for non-public networks is being explored. The non-public network is deployed with the support of the network functions of these three MNOs' public networks. In the Philippines, 3.30-3.40GHz is being used to provide public mobile services by a national MNO.

Q3. Do you agree with our assessment of current spectrum use and potential impacts?

Huawei NZ agrees with RSM on the assessment results of the current spectrum use in NZ.

Q4. Do you agree with the assessment that regional and local use will not be able to coexist in the same geographic area on the same frequency. If not, why?

Huawei NZ agrees with RSM and is of the view that it is very challenging for two separated independently operating networks, one for regional use and the other for local use, to operate on the same frequency spectrum in the same geographic area. However, it is possible if the local network is integrated into the non-public regional network and/or shares some network functions to mitigate the interference.

Huawei NZ agrees with RSM on the three approaches of interference management stated in 2.3.2.2 of the Discussion Document. Among these approaches, the guard-band bandwidth of 40 MHz is suggested as a tentative value because this value is dependent on the transceiver performance. This value may need a review to determine an appropriate number when more product information is available.

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?

Huawei NZ agrees with RSM and is of the view that it is possible for the indoor use to share the same frequency with the regional or local use in the same geographic area, provided that sufficient isolation is made.

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?

If this 3.30-3.40GHz spectrum is to be planned in the time division duplex (TDD) manner, the most efficient way to manage spectrum use starts with a common frame structure and robust synchronisation among the communication systems sharing this spectrum. This implies that these communication systems would most likely employ the technologies from the same technology family. In addition, radio transceivers used by these systems need to comply with the standard radio specifications to minimise the in-band interference when these systems share the same frequency spectrum or use adjacent spectrums in the same geographic area.

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?

No comment

Q8. How much spectrum is required for regional and uses and how much is needed for local Use

No comment

Q9. What equipment options and standards should we consider for the 3.30 – 3.40 GHz band? If we adopt multiple standards how should we manage potential interference issues between the technologies while minimising inefficient use of spectrum?

In light of the increasing likelihood of 3.3-3.4GHz being identified for IMT and reaching global harmonisation, Huawei foresees a proliferation of equipment, on both network side and terminal side, are produced to operate on this band in compliance with the 3GPP standards. Thus in this submission, Huawei NZ addresses the 3GPP-based technology options and the related high level dependencies from the technical perspective.

Option 1 is the 3GPP 4G Long Term Evolution (LTE). This option has the following potentials.

1. TDD LTE can reach sufficient spectrum efficiency for broadband services. It has been verified through field tests that TDD LTE can support more than 8bps/Hz spectrum efficiency in the downlink[1]. This spectrum efficiency is sufficient in the provision of broadband services when an appropriate spectrum bandwidth is utilised. For example, for a total bandwidth of 60MHz operating bandwidth, three TDD LTE cells can be made where each cell is given 20MHz bandwidth. Each cell can achieve 120Mbps (=8bps/Hz * 20MHz*0.75, assuming 3:1 DL-to-UL ratio) average downlink throughput of a cell where multiple subscribers can concurrently access the cell service.
2. TDD LTE can be used as a part of a non-public network solution, and Huawei successfully delivered a few such solutions in recent years. Readers are encouraged to read [2, 3] for examples and more details about the success stories of Huawei LTE-based non-public networks. These Huawei LTE-based non-public network solutions are particularly suitable for SMEs (small-to-medium sized enterprises) which often require higher robustness than conventional home broadband services, and Huawei NZ believes these solutions can benefit business of a similar scale in New Zealand.
3. From the signal propagation perspective, TDD LTE can achieve a larger cell radius than TDD NR's as per the outcomes of the analytical comparisons among the mainstream LTE and NR frame structures adopted by global operators. Huawei NZ carried out this analytical study in

[1] Huawei TDD 8TRX RF equipment is assumed.

2018, and the relevant technical details were provided to RSM as a part of our contribution to the technical discussions of C-band allocation. For the conciseness of this submission the study details are omitted. Huawei NZ can provide these details again upon RSM's request.

4. 3GPP has defined the Band 52 for LTE over 3.3-3.4GHz.
5. A number of terminals have claimed support Band 52 and can be found in the Global Supplier Association (GSA) terminal database [4].
6. Huawei has made available commercial products that are capable of operating on Band 52.
7. LTE is believed by the industry, in general, having plenty of lifetime left., and the first LTE network sunset around the world is expected to be after 2030 [5].

TDD LTE has the following high-level dependencies.

1. Deploying TDD LTE on band 52 will expect a specific frame structure to be used for 5G networks in the adjacent 3.4-3.8GHz spectrum in order to mitigate the in-band interference; otherwise interference management methods, such as a guard band of more than 20MHz bandwidth between 3.3-3.4GHz and 3.4-3.8GHz, are needed. This does not mean that 5G New Radio (NR) cannot operate on 3.4-3.8GHz, but a specific frame structure is needed to mitigate the interference between LTE on 3.3-3.4GHz and NR on 3.4-3.8GHz.
2. In general, a cellular network can be described as being made up of two components, i.e., Radio Access Network (RAN) and Core Network. TDD LTE network is no exception. Prospective operators need to invest in both components. When it comes to Core investment, regional operators have the options of relying on a national MNO's Core, or building a "slim" Core of its own, or employing the looming public/private cloud-based Core.

Option 2 is 3GPP 5G NR. This option has the following potentials.

1. NR is the state-of-the-art technology by 3GPP. The eco-systems, many innovative services and applications around 5G NR are being incubated.
2. NR may have the spectrum efficiency further improved than that of LTE's. This means the average throughput of an NR cell can be more than that of an LTE cell.
3. Should the synchronisation be achieved between the regional/local and the national 5G networks, the interference across the entire 3.3-3.8GHz spectrum is very likely be effectively mitigated.
4. 3GPP has defined the Band n78 that covers the entire 3.3-3.8GHz.
5. There is a plethora of terminals claiming to support n78 [4].

6. Huawei has made available a wide range of Band n78 capable RAN products.
7. Huawei has also recently made available 5G technical solutions, including network slicing and edge computing, for the commercial deployment of private networks [6].

TDD NR has the following high-level dependencies.

1. 5G NR is in its early roll-out phase since 2020 around the world. In this early phase, the 5G NR network is implemented via the non-standalone (NSA) network structure, where one LTE band is used as the anchor band that provides control channels for both LTE and NR. This means that the regional/local operators will need one LTE band to work together with the 3.3-3.4GHz band should the 3.3-3.4GHz band employ NR.
2. Down the road, 5G network evolves towards the stand-alone (SA) network architecture where an NR band does not need an LTE band to assist in forming the radio access network. This SA network roll-out on the global scale is expected to be no earlier than 2023.
3. No matter NSA or SA network architectures, an operator needs to invest on both the RAN and the Core network components. Again regional operators have the options of relying on a national MNO's Core, or building a "slim" Core of its own, or employing the looming public/private cloud-based Core.

5G RAN, and Core components are believed, in general, more expensive than their LTE counterparts.

Q10. 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?

No Comment

Q11. 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?

No comment

Q12. What are sort of rules should be applied to the authorisation mechanisms to ensure compatibility and fair access?

No comment

Q13. 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?

No comment

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