RADIO SPECTRUM MANAGEMENT

NOT GOVERNMENT POLICY

3.3 GHz Regional & non-national use in New Zealand

Discussion document

August 2021

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

New Zealand Government

Disclaimer

The opinions contained in this document are those of the Ministry of Business, Innovation and Employment and do not reflect official government policy. Readers are advised to seek specific legal advice from a qualified professional person before undertaking any action in reliance on the contents of this publication. The contents of this discussion paper must not be construed as legal advice. The Ministry does not accept any responsibility or liability whatsoever whether in contract, tort, equity or otherwise for any action taken as a result of reading, or reliance placed on the Ministry because of having read, any part, or all, of the information in this discussion paper or for any error, inadequacy, deficiency, flaw in or omission from the discussion paper.

ISBN: 978-1-99-100860-2

Contents

Glossary

Abbreviation/Term	Meaning
3GPP	Third Generation Partnership Project
4G	Fourth generation cellular technology
5G	Fifth generation cellular technology
ACMA	Australian Communications and Media Authority
BS	Base Station
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FWA	Fixed wireless access
GURL	General User Radio Licence
ITU	International Telecommunications Union
LTE	Long term evolution or 4G technology
MSP	Managed Spectrum Park
NR	New Radio, the radio terminology for 5G
RR	ITU Radio Regulations
TDD	Time Division Duplex. The same frequencies are used for both uplink and downlink, with the network alternating between uplink and downlink on a time basis
The Ministry	The Ministry of Business, Innovation and Employment
The Regulations	Radiocommunications Regulations 2001
UE	User Equipment
WRC	World Radiocommunications Conference

Invitation for submissions

This document sets out the spectrum plan for future use of radio frequencies between 3.30 and 3.41 GHz in New Zealand.

Interested parties are invited to comment on the content of this document, in particular the questions posed, and on any related issues. Comments should be submitted in writing, no later than **5pm** on 31 August 2021.

By email: *(preferred option)*

Radio.Spectrum@mbie.govt.nz

Subject line: "3.3 GHz use in New Zealand"

Or

By post:

3.3 GHz use in New Zealand
Radio Spectrum Management Policy and Planning
Ministry of Business, Innovation and Employment
PO Box 2847
WELLINGTON 6140

Any party wishing to discuss the proposals with Ministry officials should, in the first instance, email Radio.Spectrum@mbie.govt.nz

Next steps

Once the window for submissions has closed, RSM will:

- publish the submissions;
- analyse the submissions and feed the results into our planning work;
- finalise our advice and brief the Minister for the Digital Economy and Communications; and
- publish the final decisions.

Publication and public release of submissions

Except for material that may be defamatory or out of scope, the Ministry of Business, Innovation and Employment (the Ministry) will post all written submissions on the Radio Spectrum Management website at www.rsm.govt.nz. The Ministry will consider you to have consented to posting by making a submission, unless you clearly specify otherwise in your submission.

Submissions are also subject to the Official Information Act 1982. If you have any objection to the release of any information in your submission, please set this out clearly with your submission. In particular, identify which part(s) you consider should be withheld, and explain the reasons(s) for withholding the information. The Ministry will take such objections into account when responding to requests under the Official Information Act 1982.

Privacy Act 2020

The Privacy Act 2020 establishes certain principles with respect to the collection, use and disclosure by various agencies, including the Ministry, of information relating to individuals and access by individuals to information relating to them, held by such agencies. Any personal information you supply to the Ministry in the course of making a submission will be used by the Ministry in conjunction with consideration of matters covered by this document only. Please clearly indicate in your submission if you do not wish your name to be included in any summary the Ministry may prepare for public release on submissions received.

Executive Summary

Radio Spectrum Management (RSM) is considering the best use of spectrum from 3.30 - 3.41 GHz. Currently, the band 3.30 - 3.41 GHz is mostly licensed under general authorisation regimes. We believe that actual use is low and that the band is underutilised.

This consultation paper proposes new uses of this band. Wireless Internet Service Providers provide valuable rural broadband services and need more spectrum to meet the growing requirements of their customers. In addition, we have identified emergent demand for private networks to support industry verticals. This consultation document proposes that the band be repurposed to allow access for these uses.

In this document we propose three band plan options, suggestions for equipment use, and potential licensing mechanisms. We seek your feedback on these proposals.

1 Introduction

1.1 Background

This paper sets out RSM's initial thinking on future uses and technical parameters for the 3.30 - 3.41 GHz band. This paper will cover band planning, technical considerations, and options for new use of the band. RSM will take feedback from this consultation into consideration when finalising decisions on the band plan, licensing rules, and technical requirements.

In 2018, the Government decided to allocate 3.41 - 3.80 GHz (the "3.5 GHz band") for national 5G cellular mobile services. Wireless Internet Service Providers (WISPs) are currently using portions of the 3.5 GHz band to provide regional broadband services. These licences will expire on 31 October 2022 and the new 5G nationwide rights will begin in November 2022.

We are aware that WISPs require alternative spectrum to be able to continue providing broadband services. We are also aware of a growing demand for private networks to support industry verticals, with a number of regulators internationally making spectrum available for this use.

We have identified that the spectrum between 3.30 - 3.40 GHz provides an opportunity for long-term spectrum access for regional uses such as regional broadband and private networks. These use cases are generally in a localised area and do not need access to spectrum on a nationwide basis. We are seeking feedback on these options but are also open to other suggestions.

1.2 Frequency range under consideration

The scope of this document includes the spectrum between 3.30 - 3.41 GHz. However, we are proposing that the 10 MHz from 3.40 - 3.41 GHz is allocated for national use as part of the 3.5 GHz band. This would extend the 3.5 GHz band from 3.41 - 3.80 GHz to 3.40 - 3.80 GHz, resulting in 400 MHz available for national use. This expansion of the 3.5 GHz band has some practical benefits for the 3.5 GHz allocation process and still leaves a good amount of spectrum for the other use cases we are considering.

The remainder of this consultation will consider the 100 MHz between 3.30 - 3.40 GHz (the "3.3 GHz band") for regional and non-national use.

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?

1.3 International developments

International developments impact on spectrum decision making in New Zealand. In particular, aligning with other nations allows us to access equipment that is manufactured at scale, reducing the costs for New Zealand. Below are examples of developments that we may take into consideration when deciding on the best use of the 3.3 GHz band.

New Zealand has allocated 3.3 - 3.4 GHz for fixed and mobile services on a primary basis, adding itself to a footnote (5.429) in the International Telecommunications Union (ITU) Radio Regulations (RR). 3.3 - 3.4 GHz is also included in studies for an International Mobile Telecommunications (IMT) identification in Region 2 (the Americas), under agenda item 1.2 for World Radiocommunication Conference 2023 (WRC 23). Additionally, this frequency range is included in APT Report[1] and Recommendation ITU-R M.1036.

3GPP has specified 3.3 - 4.2 GHz (n77) and 3.3 - 3.8 GHz (n78) for 5G networks, and major telecommunication equipment vendors have indicated their ability to supply equipment utilising 3GPP 5G standards in these frequency ranges. Therefore we expect that there will be 5G equipment available to use the 3.3 GHz band.

The Federal Communications Commission (FCC) in the United States has made the 3.55 - 3.70 GHz band available for Citizen Broadband Radio Service (CBRS) system. The FCC is considering facilitating shared use in the 3.10 - 3.55 GHz band with a focus on 3.45 - 3.55 GHz.[1] This is likely to increase the range of equipment that is available for use in the 3.3 GHz band.

Europe is making 3.4 - 3.8 GHz available for mobile and fixed communications networks and electronic communications services, which includes 5G networks.[2] The European decisions set out the technical conditions suitable for 5G and encourage the migration of other services out of the 3.4 - 3.8 GHz band. While this does not cover the 3.3 - 3.4 GHz band, it is directly adjacent and could further drive development of compatible equipment.

In addition, China and India have 5G networks operating at 3.3 - 3.4 GHz. African Telecommunications Union (part of Region 1) and Inter-American Telecommunication Commission (CITEL) in Region 2 have indicated a preference to operate down to 3.3 GHz for 5G services.

2 New use cases and options

We consider that the 3.3 GHz band may be suitable for non-national spectrum access as well as continued access for existing secondary users of the band. Below, we describe two possible uses for the 3.3 GHz band.

2.1 Regional broadband

As connectivity demands grow, the role of Wireless Internet Service Providers in keeping rural New Zealand connected is important. WISPs provide connectivity for rural communities through fixed wireless access technologies, typically beyond the coverage of nationwide terrestrial networks. The RBI2[3] project has contributed funding to further WISP expansion but the WISPs' capacity is constrained by spectrum availability. We consider that providing more spectrum could enable better, faster rural broadband services.

2.2 Private networks

Spectrum may allow organisations and industry verticals to run their own networks. Organisations may have a single campus that requires a dedicated service eg remote control vehicles or tracking of objects. Alternatively, organisations may have multiple sites across the country that require connectivity. Unlike Mobile Network Operators (MNOs), private networks do not require continuous nationwide coverage and operate in localised areas.[4]

[1] https://www.fcc.gov/document/fcc-seeks-facilitate-5g-345-355-ghz-band-0
[2] See ECC Decision (11)06 https://docdb.cept.org/download/1531 and EC Decision 2019/235/EU https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32019D0235
[3] The Rural Broadband Initiative (RBI) Phase two project was launched in 2018. See https://www.crowninfrastructure.govt.nz/rural/what/
[4] For example, a multi-site organisation such as a university or manufacturer would use industry networks or private networks. When connectivity is required at a multi-site organisation, (a) dedicated network(s) deliver connectivity to all area of the given site.

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?

2.3 Current spectrum use and potential impacts

Currently, the 3.3 GHz band is underutilised in New Zealand. There are three existing uses: Amateur, Ultra wide band (UWB) and Radiolocation (eg radar). There is also recognition of the radio astronomy service in the ITU RR. In the lower adjacent band there is Radiolocation and in the upper adjacent band there will be national 5G networks.

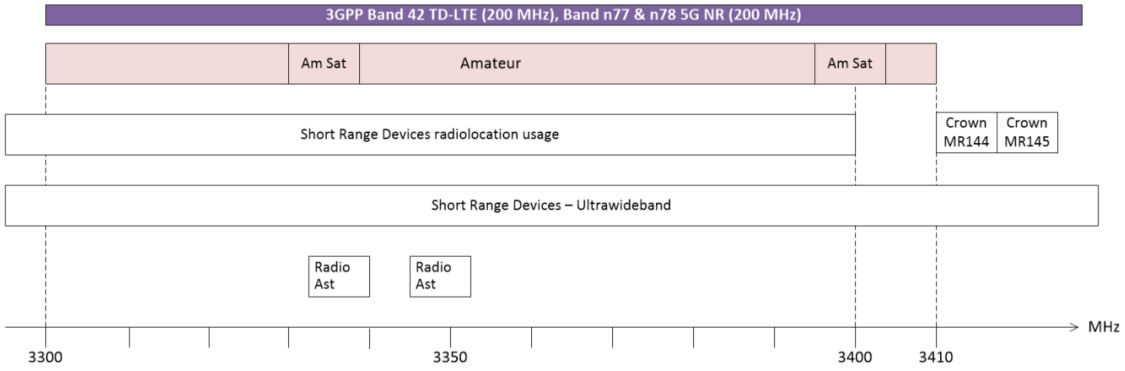

Figure 1 Current Spectrum use between 3.30 and 3.41 GHz

2.3.1 In band uses

Ultra Wide Band

UWB uses are enabled by the UWB General User Radio License (GURL) and are secondary to licenced services. UWB technology can be used for data-communication, ground penetrating radar or object sensing. UWB applications in this band include utility and building maintenance, as well as road and rail surface investigation and maintenance.

Impacts

UWB systems are designed to be robust to interference and must accept interference from other spectrum users. UWB systems are already secondary users in the 5G band between 3.59 and 3.70 GHz. There are no known compatibility issues between high power 5G networks and UWB systems. While there is a small possibility of degradation to UWB performance from 5G services, it is unlikely.

Radiolocation

Radiolocation is permitted in the GURL for Short Range Devices. However, we are not aware of any radiolocation equipment available in New Zealand that utilises this licence. This GURL entry was originally added to align with the United States use of 2.900 - 3260 MHz, 3.267 – 3.332 MHz and 3.339 - 3.345 MHz for Short Range Devices, specifically for Intelligent Transport Systems (ITS) use[5]. Since this GURL was added international interest in ITS has changed focus to the Dedicated Short-Range Communications (DSRC) standard using 5.825 - 5.925 GHz.

[5] https://www.ecfr.gov/cgi-bin/text-idx?SID=e4dedb1523533ec33e6aef4800d2be42&mc=true&node=pt47.1.15&rgn=div5#se47.1.15_1251

Impacts

As it is unlikely that equipment for Radiolocation will be available in the 3.3 GHz band it is also unlikely that new uses of 3.3 – 3.4 GHz will have an impact on Radiolocation. Radiolocation under the GURL is on a non-interference basis and therefore is secondary to licensed services.

2.3.1.1 Amateur

There is currently one licenced amateur station in the 3.3 - 3.4 GHz band, and itis used for a repeater in Wellington. Amateur Radio Operators can also use this band under the General User Radio Licence GURL[6] but we understand that this use is low. Amateur satellite operation may also be in the 3.40 - 3.41 MHz portion of the band.

Impact

We consider that co-existence between amateur radio services and 5G use on the same or adjacent frequencies within an area could be challenging. Interference could impact both the 5G networks and the amateur radios. Under the GURL, in the 3.3 - 3.4 GHz band, amateur operators must accept interference and not cause interference to other services.

It may be possible to manage the interference issues between 5G and Amateurs. This could be undertaken in the following ways:

- Amateur users of the band can either accept interference to their operations in areas where there is 5G or clear the band and move to alternative spectrum.
- To manage any harmful interference to 5G services, the power permitted in the Amateur GURL could be lowered.
- We could also undertake user education of Amateur operators, encouraging users to listen before they transmit or to check the register of radio frequencies first.

Our assessment is that Radio Amateurs can continue to use the 3.3 GHz band in the short-medium term but we will revisit this if we need to address interference issues.

2.3.1.2 Radio Astronomy

There is recognition of the radio astronomy service in the ITU Radio Regulations under RR No. 5.149. There is also a provision in PIB 21 and the ITU Radio Regulations for radio astronomy at 3.332 - 3.339 GHz, and at 3.3458 - 3.3525 GHz. However, there are no licences for radio astronomy in New Zealand.

Impacts

There are currently no receiver protection licences for Radio Astronomy.

Radio Astronomy services typically use very sensitive receivers and would be susceptible to in-band and unwanted emissions. However, there are unlikely to be many Radio Astronomy receivers, and they would be at defined locations. Therefore interference to Radio Astronomy can be managed through defining receive protection licences and quiet zones around those sites.

[6] https://gazette.govt.nz/notice/id/2017-go3567

2.3.2 Adjacent band users

2.3.2.1 Radiolocation below 3.3 GHz

The 2.90 - 3.1 GHz band is allocated to Radiolocation and Radio-navigation, and the 3.1 - 3.3 GHz band is allocated to Radiolocation.

Impacts

There are no radiolocation licences in the 3.1 - 3.3 GHz band at this time. There are many maritime radars operating below 3.1 GHz. However, given the 200 MHz of frequency separation from the 3.3 GHz band it is very unlikely there will be any impact on those services.

2.3.2.2 National 5G networks above 3.4 GHz

It has previously been decided that the 3.5 GHz band will be allocated for long-term rights, becoming available from 1 November 2022.

Where adjacent 5G networks are unsynchronised there is a risk of interference. Interference issues can be managed through isolation (eg geographic or frequency separation) or synchronisation.

Impacts

We have previously considered synchronisation issues in the 3.5 GHz band, including looking at issues for operating both regional and national uses on adjacent frequencies. Some of these considerations could be applicable to non-national uses in the 3.3 - 3.4 GHz band and national uses in the 3.4 - 3.8 GHz band. To allow this we would have to manage interference. Options include:

- implementing a 40 MHz guard band;
- mandatory synchronisation; and
- geographic or frequency separation.

Synchronisation would be a more efficient use of spectrum and is the preferred option. However, synchronisation will only be possible with compatible equipment. Compatibility issues may arise if non-3GPP compliant equipment is permitted in the 3.3 GHz band. If non-3GPP compliant equipment is permitted, compatibility issues could be minimised with frequency or geographic separation. Further detail on equipment and standards will continue in section 2.4.2.

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

2.4 Technical feasibility for the deployment services in the 3.3 GHz band

We have assessed the technical feasibility of different scenarios for the use of the 3.3 GHz band. These are shown in Figure 2. As a number of countries have implemented local, regional or stratified access in parts of their 5G plans we have used this information to inform our assessment.

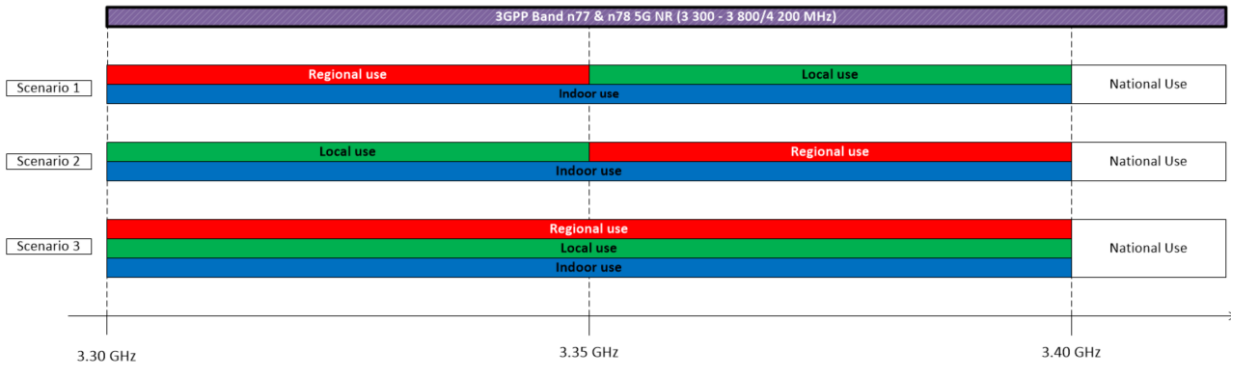

Figure 2 Deployment scenarios and options for the 3.3 GHz band

The three scenarios we have considered are regional, local and indoor use. In this case by "regional" we mean use in rural or semi-rural areas. "Local" use is a private network at a specific location. Indoor use is the deployment of radio base stations within a particular building.

2.4.1 Assessment of regional, local and indoor use within the same geographic area

In our assessment we have considered real world factors such as geometries, building entry loss and clutter losses. We have considered an interference-limited environment rather than a noise-limited environment. We have also assumed that all users are synchronised within the band and that national 5G networks are operating above 3.4 GHz.

Our initial view is that regional and local use would not be able to share in the same geographic area on the same frequency. There is likely to be significant degradation in coverage and/or capacity. This is due to insufficient isolation (eg propagation losses) between high power outdoor use of regional wide area base stations and local medium area base stations. Sharing would need to be managed through geographic separation or use of different frequencies in that area.

We consider that sharing is likely to be feasible between regional and indoor use. Sharing is also likely to be feasible for local and indoor use, although there are some risks if services were located in close proximity or at certain geometries. This is due to sufficient isolation (eg propagation losses) between regional / local wide / medium area base station operating outdoors and indoor small base stations operating indoors at low power. A detailed technical analysis would be needed following this consultation to define the exact sharing criteria. Further detail on the scenarios is as follows:

Based on this assessment, Scenario 1 and 2 band plans in Figure 2 could be used within the same geographic area. However, in Scenario 3 it is likely that different frequencies will need to be used for local and regional in the same area. In the case of Scenario 3, it might also be beneficial to interleave local and regional use between different geographical areas to maximise spectrum reuse.

There may also be other potential scenarios for band planning for indoor, local and regional services that we have not considered. We welcome suggestions on other options.

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?

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?

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?

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?

Q8. How much spectrum is required for regional and uses and how much is needed for Local use?

2.4.2 Equipment options and standards

There are different equipment options and standards that could be adopted for the 3.3 - 3.4 GHz band. Equipment options and standards include:

- **4G Long Term Evolution (LTE).** 3GPP has planned 3.3 - 3.4 GHz as 4G LTE band 52. Relevant specifications are:
    - ETSI TS 136 104 V14.3.0 "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception"
    - ETSI TS 136 101 V14.5.0 "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception"
- **5G New Radio (NR)** 3GPP has specified this spectrum block in the frequency ranges of Bands n77 and n78. Relevant Specifications are:
    - ETSI TS 136 104 (Release 16) *"5G; NR; Base Station (BS) radio transmission and reception"*
    - ETSI TS 136 101 (Release 16) *" 5G; NR; User Equipment (UE) radio transmission and reception"*
- **Digital Multipoint Radio System (DMRS).** There are also non-3GPP technologies available in this frequency range, such as ETSI Digital Multipoint Radio System (DMRS). The relevant standard is:
    - ETSI EN 302 326. "Fixed Radio Systems; Multipoint Equipment and Antennas"

In choosing what standards to adopt for the 3.3 GHz band, there are a number of factors that need to be considered. These include:

- Sharing between users is more complex if the users are operating to different standards.
- Non-synchronised TDD networks will increase the risk of interference. Different technologies using different standards may not be able to adopt the same synchronisation structures.
- The adjacent 3.5 GHz band will be used for synchronised 5G networks. Those networks will (eventually) be widespread.

- The transmitter and receiver performance of equipment – good performance minimises the risks of interference to adjacent users.
- Equipment availability along with the technology lifespan (ie will the technology continue to be available in the future).

We are of the view that, to make the most efficient use of the spectrum available, equipment will need to be synchronised within the 3.3 GHz band and use a similar synchronisation structure to 5G NR operating in the 3.5 GHz band. Transmitter adjacent channel leakage ratios, and receiver adjacent channel selectivity, will need to have 3GPP-like performance. If equipment is not synchronised or has a poorer transmitter and receiver performance this may result in compatibility issues. Depending on the differences in performance, this may need to be managed with frequency or geographic separation to minimise issues, particularly for regional and local use cases, which could create inefficient use of spectrum.

We do not believe that 4G LTE equipment will be able to fully synchronise with 5G as the frame structure is different. We consider that DMRS in EN 302 326 diverges from 3GPP performance and we are not aware that it can be synchronised with 5G.

Q9. What equipment options and standards should we consider for the 3.3 GHz band?

Q10. If we adopt multiple standards how should we manage interference issues while minimising inefficient use of spectrum?

3 Making the 3.3 GHz band available for new uses

There are a number of different mechanisms that could be considered for making the 3.3 GHz band available for new uses on a non-national basis. There are different authorisation mechanisms used internationally (see Annex 1 for some examples) as well as existing mechanisms used in New Zealand.

3.1 Existing mechanisms for sub-national spectrum allocation

RSM has previously used two spectrum licensing regimes for regional allocations. They are the:

- Managed Spectrum Park (MSP): The MSP has a generic set of engineering parameters to access 40 MHz of TDD configured spectrum. When the number of applications exceeds the engineering possibilities, a ballot can be undertaken to reduce entrants. Restrictions apply on the number of areas that licences could be held by a licensee.
- 3.5 GHz FDD regional access: From 2002 – 2016, RSM undertook licensing and allocated pre-engineered licences competitively in geographically pre-defined areas. Restrictions were placed on the number of areas that licences could be held by any one licensee or associated licensees.

3.2 Further licensing options that could be considered for 3.3 GHz in New Zealand

This section outlines initial thoughts on the authorisation mechanisms that could be considered for indoor, local and regional use in New Zealand. These are listed to stimulate views from stakeholders on access to the spectrum. There may be additional options that are not listed below.

3.2.1 Indoor Use

General Authorisation

Under a stringent set of rules for indoor low power use, we could allow anyone to operate in a small area eg in a single building, without an individual licence on a non-interference basis.

First in time licences

Authorisation of indoor use on a first come first served individual licence basis for a particular location eg in a single building. This may provide more certainty in the management of interference compared to GULs.

3.2.2 Local use

First in time licences

This would allow for users to get licences for the small localised areas they need (eg a campus). This would require a set of rules, created by RSM, to manage access and any new applicants will need to work around existing (or planned) licences nearby.

Interference cooperation mechanisms

Adopt a scheme which requires the co-operation of nearby licensees. If the co-operation agreement cannot be achieved, a default signal level or field strength that protects the adjacent licence at the boundary of a licenced area (eg campus boundary) applies.

Defined areas or block assignment

This would split the country into a grid of defined blocks (eg 1km x 1km blocks) and licence local use on a block by block basis where users can acquire the number of blocks they need. This will offer the opportunity to test the demand for areas.

3.2.3 Regional

First in time licences

This would allow for users to get licences to cover areas they need (eg towns). There would need to be a set of rules put in place by RSM to manage access and any new licences will need to work around existing (or planned) licences in adjacent areas.

Defined areas or block assignment

This splits the country into a grid of defined blocks (eg 1km x 1km blocks, mesh blocks, Territorial Local Authority (TLA) ward boundaries) and licence regional use on a block by block basis where users can acquire the number of blocks they need. It is likely that a number of blocks would be aggregated to provide a service or coverage area. This will would provide the opportunity to test the demand for areas.

Technically pre-planned licences

Undertake pre-planning and pre-engineering of regional licences (similar to the 2001 3.5 GHz regional access licences). We believe that there are potentially a number of ways to pre-plan licences, allowing for an optimum number of licences that could be accommodated and could also incorporate defined areas or block assignment concepts.

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?

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?

Q13. What are sort of rules should be applied to the authorisation mechanisms to ensure compatibility and fair access?

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?

4 Summary of questions

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?

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?

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

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?

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?

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?

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?

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

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

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?

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?

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

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?

Annex 1

Authorisation mechanisms used in other countries

Australia

In Australia, the Australian Communications and Media Authority (ACMA) is offering Area Wide Licences[7] (AWLs) for 5G services in the mmWave band.[8] These AWLs aim to provide a 'building block' system. These building blocks can include features such as area-based operation, enabling space communications from earth, and broad application permission.

The AWL transmitter licence type can authorise the operation of one or more radiocommunications devices within a defined geographic area, at a frequency or range of frequencies specified on the licence, subject to the conditions included in the licence. The AWL approach is aimed at industry verticals.

Germany

BNetzA (the German Federal Network Agency) has set up local licensing in the 3.7 - 3.8 GHz range.[9] Within this range, organisations can apply for licences from 10 - 100 MHz in bandwidth for local 5G use. The technical conditions mean that signal levels at the boundary of their licence area (ie property boundary) are set at a maximum level.

A resource fee for the licence is charged based on a number of factors including: the bandwidth used (ie 10 - 100 MHz), the duration of the allocation in years (1-10 years) and the area covered by the proposed licence (in km2). As of May 2021, over 123 licences have been issued.[10]

Japan

In Japan, the Ministry of Internal Affairs and Communications (MIC) has developed rules for 4.8 - 4.9 GHz.[11] This local 5G service will be used within licensees' own facilities or land. Other parties may obtain licenses and construct systems at the request of facilities and landowners. However national MNO (ie those MNOs with existing spectrum for cellular networks) cannot obtain local 5G licenses.

The MIC sees that local 5G enables the following benefits:

- establishment of 5G systems prior to area coverage by mobile carriers;
- establishment of customized networks with flexible specifications that meet local needs; and
- operation of networks less vulnerable to communication failures and disasters.

[7] https://www.acma.gov.au/area-wide-apparatus-licensing-26-and-28-ghz-bands
[8] 27.5 – 30 GHz which RSM has recently consulted on for high band 5G services
[9] https://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Frequenzen/OeffentlicheNetze/LokaleNetze/lokalenetze-node.html
[10] "5G - Spectrum for Verticals ?! Models, Approaches, Role of MNOs to meet vertical connectivity needs" Alexander Kühn, Deputy Head of Section 7th Asia-Pacific Spectrum Management Conference (Virtual) 24 May 2021 https://spectrummanagement.asia/
[11] https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/newsletter/pdf/vol30/no04.pdf Vol. 30 No.4 December, 26, 2019

United States

In the United States, the Federal Communications Commission (FCC) has developed the CBRS system[12] for the 3.55 - 3.70 GHz band. This allows tiered access and the tiers operate as follows:

- Tier 1 – Incumbent Access: Incumbent Access users (including but not limited to some federal users) receive protection against harmful interference from both Priority Access Licensees (PAL) – tier 2 and General Authorized Access (GAA) – tier 3 users.
- Tier 2 – Priority Access: PALs are licensed on a county-by-county basis throughout the country. PALs must protect and accept interference from tier 1 users but receive protection from tier 3 users.
- Tier 3 – GAA: The GAA tier is licensed to enable flexible access to the band. GAA users must not cause harmful interference to tier 1 or tier 2 users and must accept interference from these users. GAA users also have no interference protection from other GAA users.

United Kingdom

In the United Kingdom, Ofcom has set up shared access spectrum[13] in a number of bands including 3.8 - 4.2 GHz. Technical rules include power limits but synchronisation is not mandated at this time in this frequency range.

Two types of licences are available within this frequency range:

- Low power licences authorises users to deploy as many base stations as they require within a circular area with a radius of 50 metres as well as the associated fixed, nomadic or mobile terminals connected to the base stations operating within the area; or
- Medium power licence authorises a single base station and the associated fixed, nomadic or mobile terminals connected to the base station. Licence holders must keep a record of all connected devices to medium powered networks.

[12] https://www.fcc.gov/35-ghz-band-overview

[13] https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/shared-access