3.3 GHz Regional & non-national use in New Zealand

Submission | RSM

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Contents

Executive Summary

Thank you for the opportunity to comment on the 3.3 GHz regional & non-national use in New Zealand discussion paper (**the discussion paper**).

We support Ministry proposals to:

- Incorporate 10 MHz at the top of the range (3.40 - 3.41 GHz) in to the 3.5 GHz band, better aligning use of the spectrum with major economies.
- Repurpose the 3.3 – 3.4 GHz range (**3.3 GHz band**) for use by regional Wireless Internet Service Providers (**WISPs**), private networks and industry verticals, and
- Implement technical conditions requiring 3.3 GHz band users to deploy synchronised systems (frame structure and timing). This will maximise the use of the spectrum as unsynchronised operation is only possible with significant guard bands and geographic distancing.

Further, as any installation can potentially interfere with adjacent system and band operations, we recommend that all systems should be licensed in order to ensure co-ordination between users. This should include private and indoor installations. The ECC reports that even where power limits are applied to indoor systems, they can still interfere with, and suffer interference from, adjacent systems[1].

While do not have a firm view on the proposed band-plans we understand that local use in the MBIE's paper means private networks. These networks may be indoors- such as on a factory premises or outdoors such as on a campus. We recommend that RSM differentiates between them when considering a band plan.

We also suggest the Ministry consider allocating low power indoor use adjacent to the spectrum to the MNOs. This is because, even with synchronised operation, systems may potentially interfere with each other due to say partial synchronisation or semi synchronisation. Furthermore, we agree that the Ministry will need to take a "hands on" approach to licensing if private and regional providers were located within the same band. The discussion paper sets out some good options for doing this. In all cases the Ministry should set power and technical conditions for indoor deployments.

[1] CEPT ECC report 296

Introduction

1. Thank you for the opportunity to comment on the 3.3 GHz Regional & non-national use in New Zealand discussion paper (**the discussion paper**).

2. Radio Spectrum Management (**RSM**) is considering the best use of 3.30 - 3.41 GHz band spectrum and has proposed to:

    a. Include the top 10MHz (3.4-3.41 GHz) in the 3.5GHz band, and

    b. Repurpose the remaining 3.3-3.4GHz range (**3.3 GHz band**) for WISPs, private networks, and industry verticals.

3. We support RSMs' proposed approach that would align us with 3GPP standards and major economies around the world, ensuring that innovation technologies and services are available for the New Zealand businesses and consumers.

Incorporating 3.40 to 3.41GHz in to the 3.5GHz band

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?

4. We support allocating all of the spectrum 3.4 to 3.8 GHz for national mobile use. This is a key 5G band and aligns us with the band plans adopted by authorities - and major operator deployments - around the world[2].

5. Nonetheless, we remain concerned at any proposals to continue satellite operations in the 3.5 GHz band. This would result in co-channel mobile and FSS feeder links and require detailed co-ordination and mitigation measures. Sharing is generally problematic as satellite receivers currently use old filters and this requires site isolation – i.e., earth station site shielding, restricted zones etc - to achieve the necessary I/N ratios. In effect, the onus on mitigation is solely on the mobile service.

Options for the 3.3 to 3.4 GHz band

Use cases

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?

6. The discussion paper discusses applying the 3.3GHz band to regional and non-national use, describing two possible users:

    a. To enable better, faster rural broadband services. The discussion paper sets out that, while RBI2 funding has contributed to further WISP expansion, WISP capacity is constrained by spectrum availability[3], and

    b. To allow organisations and industry verticals to run their own networks. Private networks (allowing organisations and industry verticals to run their own localised networks).

[2] For example, see GSA Snapshot of National Spectrum Positions: Spectrum in the C-Band (July 2021)
[3] Discussion paper at 2.1

7. We support using the 3.3 GHz band for rural broadband and private networks. Access to the band would mean that more rural communities would have access to widely supported 3GPP 5G compliant technologies and services. The band sits within 3GPP band 78 (3300 - 3800 MHz) for TDD systems and is supported by major economies across all ITU Regions.

8. We also recommend that the Ministry consider providing more information on the proposed demarcation between regional and local providers as this makes a significant difference when designing the licencing and interference management framework. The discussion paper clarifies that references to "regional" networks relate to rural or semi-rural areas, "local" use is a private network at a specific location and indoor use is within a particular building[4].

9. However, semi-rural could potentially extend to fringe urban areas and is more likely to overlap with local networks (requiring more consideration of interference mitigation) and even some MNO deployments. ECC studies show that show minimum distances required between unsynchronised networks to avoid interference could be up to 60 km when operating co-channel and up to 14 km when operating in the adjacent channel without guard bands[5]. Geographic separation to this extent is likely to be possible with rural systems, but unlikely for semi-rural or urban fringe deployments.

10. In any case, the discussion paper recommends synchronised deployment and concludes that regional and local sharing is unlikely to be possible in the same geographic area on the same frequency. We agree that, if there is a material geographic overlap between private local and use, the Ministry will need to consider separate ranges within the band for these uses.

Current spectrum use and potential impacts

11. The discussion paper notes that the 3.3 GHz band is currently under-utilised in New Zealand:

    a. The band is lightly used for amateur, ultra-wide band and radiolocation purposes.

    b. In light of international standards and market trends, the band may be suitable for non-national regional broadband and private networks as well as continued access for existing secondary users of the band.

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

12. We agree the band should be made available for rural broadband and private deployments. We also note that:

    a. In terms of sharing between fixed wireless access and land-based radars (radio location), 5.429F of the ITU-RR states that[6]:

       > The use of the frequency band 3300-3400 MHz by IMT stations in the mobile service shall not cause harmful interference to, or claim protection from, systems in the radiolocation service.

       However, sharing between fixed wireless access and land-based radars (radio location) is not as challenging relative to the mobile case as referred to in this footnote. The discussion paper notes that there are maritime radars, but they are below 3.3 GHz and a sufficient guard band exists for protection of either service.

[4] Discussion paper at 2.4
[5] CEPT ECC report 296 at page 3
[6] ITU-RR at 5.429F

b. Sharing with amateur is challenging but the existing GURL states that amateur must accept interference from other sources. This should continue to be the case when 3.3G Hz band is used as proposed.

c. UWB is a secondary service and should accept interference.

d. Radio astronomy service needs large exclusion zone radii for protection. Anecdotally 3GPP recommends distance of 30 km or more.

Scenarios for the use of 3.3GHz band

13. RSM identifies three scenarios and discusses the technical issues and constraints associated with shared and regional use.

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?

14. The discussion paper analysis is premised on all users being synchronised within the band and that national (synchronised) 5G networks are operating about 3.4 GHz[7].

15. We support the proposed approach. All users in the band should be synchronised to avoid interference, enabling coexistence without the need for significant geographic separation, guard bands or additional filters[8]. However, in order to implement this, all licences within the deployment region must apply the same:

    a. Frame and time synchronisation technical conditions (including accuracy assurance) as that applying to adjacent users, including the adjacent 3.5 GHz band. Synchronisation of adjacent TDD networks with the uplink and downlink frames aligned in time is necessary to avoid interference and ensure efficient use of spectrum resources, avoiding inter-operator guard bands and additional base stations filtering.

       Unsynchronised systems may be able to exist with synchronised systems provided they are low power and an adequate coupling loss such that the I/N ratio of say -10 dB can be realised. However, for this to happen the MBIE must have a “hands on” approach so that interfering situations can be resolved.

    b. Equipment sub carrier spacings as that for national MNO operators in adjacent bands to avoid interference.

       It should be noted that over the life span of the MR, the 3GPP might recommend new frame structures that the MNOs could adopt. For example, cross division duplex is already being considered as a study item in 3GPP Rel 18. The MNOs may choose to adopt this. Additionally higher sub carrier spacings may be deployed when standardised to reduce latency. In this case the WISP spectrum holders should also adopt these frame structures and not hold innovation for the MNOs

16. The nature of TDD technologies is that uncoordinated operation requires significant geographic separation and guard bands to mitigate interference.

17. Even with synchronised operation, the usage proposed in all three scenarios above is very challenging. The proposals imply co-channel usage for different licensees and this use will need to be co-ordinated to avoid interference challenges. For example, by setting technical limits and

[7] Discussion paper at 2.4.1
[8] This is discussed on the CEPT ECC report 296, summarised at page 3

approving the location of the transmitters. Accordingly, it is often better to segment spectrum for different use cases when they overlap in geography. For example, as illustrated below using the discussion paper figure, we recommend that the Ministry consider approving only low power indoor licences at the top of the 3.3 GHz band as shown below to act as a guardband.

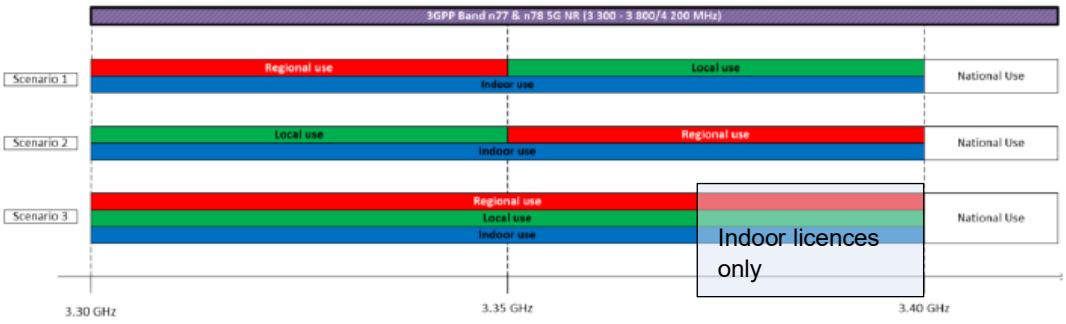

Figure 2 Deployment scenarios and options for the 3.3 GHz band

18. RSM will further inevitably have to licence each deployment to ensure that it does not interfere with adjacent band users. Overall, RSM will need to take a "hands on" approach to setting technical limits and licensing systems to achieve the sharing anticipated by the discussion paper. For example, Ofcom has set tight technical limits and will licence each installation for the 3.8 - 4.2 GHz band which is shared in UK across similar regional and private networks[9].

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?

19. Please see answer to question 4 above. As the ECC report[10] highlights, even if unsynchronised systems were limited to indoors, restrictions are still required to mitigate interference (including indoor).

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?

20. As above, we agree that specifying a common frame structure and timing will make better use of spectrum over relying on geographic separation of systems.

21. As far as the frame structure is concerned all uses in this spectrum must be aligned amongst themselves with a common frame structure and time synchronisation. Furthermore, both should be aligned with these parameters in the remaining C band, i.e., 3400 - 3800 MHz.

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?

22. There are appropriate carrier bandwidths available in this band for MBIE to segment spectrum amongst uses that overlap in geography. These carrier bandwidths are defined in 3GPP recommendations especially 38 101 and 38 104.

[9] https://www.ofcom.org.uk/__data/assets/pdf_file/0033/157884/enabling-wireless-innovation-through-local-licensing.pdf
[10] ECC 296 at page 40

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

23. Spark has no comment.

Equipment options and standards

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

24. The equipment to be deployed must meet 3GPP standards as discussed in MBIE discussion paper. Otherwise, co-existence with MNOs will be prejudiced and will result in many unspecified challenges.

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

25. Spark advises that users of this band to adopt 3GPP standards only. Furthermore, other standards should not be permitted as a licence condition.

26. These technologies are designed to work alongside other synchronised and standard compliant technologies. Significant inefficiencies would be created through deploying non-compliant technologies as, to manage interference between providers, would require guardbands and significant geographic separation.

Making the 3.3 GHz band available for new uses

27. The discussion paper outlines different authorisation mechanisms that could be adopted for the 3.3 GHz band.

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?

28. Please see our response to Q4. We agree that all three use cases can be accommodated in the band.

29. The discussion paper sets out some initial thoughts on the licensing arrangements for each of the use cases and asks:

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?

30. The differing use cases are sharing the same band and, therefore, the arrangements need to address potential contention between use cases and between users.

31. In terms of the primary use cases discussed in the paper - rural WISP, local and indoor users - compatibility and access concerns are unlikely provided technical conditions are applied and transmitter locations approved by RSM. However, if the Ministry anticipates competing

demands for regional spectrum in built up areas – i.e., WISP and local user, or multiple regional providers, operating in the same geography – we agree that additional measures may be required to mediate between competing users.

Indoor use

32. The discussion paper indicates two possible options, that indoor use be either:

    a. Permitted subject to stringent rules for indoor low power use without an individual licence on a non-interference basis, or

    b. On a first come first served individual licence basis for a particular location.

33. The Ministry should only consider approaches where indoor transmitters are licenced/registered and synchronised.

Local use

34. For localised use,

    a. First in time licences for the small localised areas subject to RSM defined rules and an obligation to work around existing (or planned) licenses nearby.

    b. An obligation to co-operate with nearby licences. If cooperation cannot be achieved, default signal level or field strength at the boundary of the licenced area.

    c. Licences for a defined area (i.e., 1km by 1km area).

35. There may be instances where a localised use overlaps with MNO's use in the area. In this case a "first in time" approach may not effectively resolve interference as both parties have a right to co-exist.

36. As for option (b) field strengths are typically used for broadcasting signals and not cellular signals. Here co-ordination is done to achieve a target I/N ratio which in turn will determine the isolation needed in between the two systems.

Regional

37. For regional use,

    a. First in time licences to cover areas they need (i.e., towns) subject to RSM rules.

    b. Licences for a defined area (i.e., 1km by 1km area),

    c. Undertake pre-planning and pre-engineering of regional licences similar to the 2011 3.5 GHz regional access licences.

38. Please see answers to localised use above.

[End]