Draft five-year spectrum outlook 2022-2026

Comment | RSM

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Executive Summary

Thank you for the opportunity to provide feedback on the draft Spectrum Outlook 2022-2026 (**the draft**).

We support the Ministry developing a common understanding of technology and market trends shaping our sector and spectrum management and setting out its medium-term work priorities. The draft usefully sets out the key technology trends, implications for how spectrum is used and proposes a number of medium-term initiatives.

While we support the Ministry's proposed approach, we recommend that the Ministry focus initially on seeking alignment across stakeholders on:

- A common view on the interference risk of non-synchronised operation. There are differing views on whether it is possible for non-synchronised transmitters to co-exist with synchronised standards-compliant technologies, and the answer to this question will directly impact the amount of spectrum that can be used in practice and how it is used. The Ministry can promote certainty by developing a clear approach, and funding model, for marginal network operators so that 3GPP standards compliant technologies can be deployed.

  Further, the Ministry could usefully develop a framework for detecting and confirming interference from un-synchronised deployments and set out how it might engage parties to identify and resolve disputed interference.

- How to efficiently solve for competing satellite and terrestrial-based spectrum users. Satellite and terrestrial based providers are increasingly operating in the same bands and competing to serve the same end-user customers. However, the current approach that sees large quantities of spectrum made available to satellite providers under administrative licences at peppercorn prices - while mobile operators pay significant amounts for spectrum -is unlikely to maximise the value of available spectrum. The Ministry should consider whether it has the tools available to it to manage this tension by, for example, applying a market-based allocation model more widely or setting incentive-based prices for licences and management rights.

- How to ensure legacy deployments do not hold back the deployment of innovative new technologies. The Ministry could provide guidance on the protections existing legacy users should have - in interfering with or being susceptible to interference from a new user - when that susceptibility is due to the use of non-standard or legacy equipment. The current framework seeks to balance protecting existing users from interference with the benefits of promoting investment in modern technologies and networks. However, it is unclear where that balance lies when existing deployments of legacy equipment have a significant impact on users in the same or adjacent bands.

Introduction

1. Thank you for the opportunity to provide feedback on the draft Spectrum Outlook 2022-2026 (**the draft**). The Spectrum Outlook identifies technology and market trends that may impact spectrum management and sets out a draft work programme for the 2022-2026 period.

2. We support the RSM spectrum management strategy set out in the draft, aligning New Zealand spectrum with ITU obligations and industry standards, and aiming to be a close follower of trends in major markets that we compare ourselves to. We have a small-scale market and harmonising with standards and major markets is the only way we can access innovative technologies and services for customers and tap into economies of scale.

3. Radio Spectrum Management (**the Ministry**) has asked whether, in developing the draft, it has got it right. In particular, it has asked:

    a. Have we identified the range of technological advancements and probable new demands relevant to New Zealand?

    b. Have we prioritised the right issues that we will need to actively manage through our work programme (to the extent this is possible to predict now)?

    c. Are there other matters that we should cover?

4. These questions are discussed below.

Spectrum Management Framework

5. We support MBIE's approach to licensing models but note the importance of the Government deciding on the licensing framework it proposes to use for allocating rights in a particular band early. New Zealand has successfully followed the "fast follower" model over the last 20 years of spectrum management, but this model was paused while Government engaged in negotiations with the Māori Spectrum Working Group on an enduring agreement for the establishment and future allocation of spectrum to the Māori Spectrum Commission.

6. Now this process is complete we will support the Ministry reverting to the fast follower model and ensuring operators have early certainty of spectrum allocations to support early investment in transformative technologies.

Technology and market trends

7. We agree that RSM has captured the key trends in the draft – i.e., new use cases and exploding data demand, evolving satellite technologies and commercial strategies, mobile network technology change, the transition to a 5G and standalone network architecture, small cells and the growth of private networks and industry verticals – and the implications for spectrum management.

8. However, the draft may not capture the full implications of these trends and additional issues could be considered in the proposed work programme. It might well be that the additional issues - below – already form part of the proposed initiatives but we thought it would be worthwhile highlighting the issues and matters that could be given additional weight in the work programme.

Satellite, spectrum and market convergence

9. The role of satellites has significantly changed in recent years. They were originally used to provide linking, broadcast and some mobile satellite services. The spectrum for satellite services

was granted by way of special provisions for satellites in the radio regulations. Individual countries usually follow this method and assign the appropriate spectrum to satellite operators. This is the case in NZ where spectrum for satellite applications is based on administrative licencing.

10. However, in recent times the business models of satellite organisations have changed. As noted in the draft, there are a number of new satellite systems that enable satellite-based providers to offer broadband and mobile services. Satellite providers expect to offer broadband access in competition to terrestrial based networks.

11. Furthermore, satellite operators are now in direct competition terrestrial operators for some spectrum bands[1]. The Ministry is in the process of allocating C band spectrum for terrestrial based services and allocation of the 26 and 28 GHz band plan will follow, both of which require the Ministry to consider competing uses of the bands. There are over-lapping and conflicting requirements from satellite and IMT providers.

12. Accordingly, while there is increasingly contested use of spectrum across these technologies, the current fragmented approach is unlikely to maximise the value of spectrum use. Satellite providers are able to access large bandwidths under the administrative licence regime at no cost beyond the minimal licence fee. There are significant opportunity costs associated with using spectrum for this purpose - in particular where it has significant value were it applied to IMT purposes - and limited incentives for satellite providers to use this spectrum efficiently. IMT providers acquire equivalent spectrum at significant cost under the management rights regime. Spectrum planning should aim to be competitively neutral and ensure best use of available spectrum.

13. We are seeing satellite and IMT technologies contesting the same bands and providing services into the same end-user markets. However, our current spectrum management approach does not cater well for this competing spectrum use and interests. The Ministry's 2021 *24 – 39 GHz Use in New Zealand* consultation[2] highlights the difficulties of managing contested use within the current framework. The Ministry was considering requests from satellite providers that the whole band be allocated to satellite even though mmWave is an important pioneer band for 5G deployments, overseas authorities had made parts of this band available to IMT applications, and there were no plausible satellite end-user demand forecasts to justify allocating the full band to satellite.

14. Ideally the Ministry would balance these competing uses and uncertainty though a market-based approach – i.e., an auction - ensuring spectrum is applied to its highest-valued use and encouraging spectrum seekers to reveal their true preferences in allocation processes. The spectrum management framework would seek competitively neutral outcomes. But satellite and mobile network operators receive differential treatment under the current regulatory framework for spectrum. Spectrum for use by New Zealand-based mobile network operators is auctioned off to us at levels that generate substantial revenue for the New Zealand Government. Spectrum allocated for use by offshore-based satellite operators is licensed at peppercorn rates. The current approach is unlikely to result in efficient management of spectrum.

15. Further, the draft notes that there will be an increasingly diverse spectrum access seekers, including private, regional, and vertical industries' providers. These access seekers are increasingly using bands that are also used by public network providers and provide partially

[1] For example, in the C and 24 - 30GHz bands.
[2] https://www.rsm.govt.nz/projects-and-auctions/consultations/24-30-ghz-use-in-new-zealand/

substitutable services. The Ministry's Spectrum Park consultation[3] highlighted the difficulties of reconciling amongst competing users within these segments, let alone public providers and standard compliant technologies.

16. The Ministry should consider how it will mediate between competing spectrum needs to ensure the most efficient allocation and use of spectrum. For example, this could include:

    a. Increased use of contestable models for allocating spectrum among competing users.

    b. Ensuring more transparency of spectrum use by users in contested bands so that RSM can assess whether allocations are necessary and/or used efficiently (where a contestable model is not possible).

    c. Seeking to provide efficient signals through incentive pricing of spectrum administrative licences and access to managed parks. For example, the Ministry could consider amending the Act so that it has the option of setting an incentive price for these licences based on the opportunity cost of that spectrum (in many cases this could reference the auction price of similar IMT bands). In which case, the pricing would provide an incentive for spectrum licence and managed parks users to efficiently demand and use spectrum that could have otherwise been used elsewhere[4].

Interference management

17. Further, the diverse number of spectrum users in the same or adjacent bands, technologies deployed and the shift towards TDD deployment, will make the interference management approach more important.

18. The 5G TDD technologies being deployed by MNOs are designed for synchronised implementation. In other words, the technologies rely on synchronisation to mitigate potential interference, enabling more efficient use of spectrum and reducing deployment planning complexity. We expect a range of 5G TDD cell technologies and networks to be deployed in mid-bands and synchronised operation is likely the only means to manage the potentially complex planning this implies.

19. However, these technologies, in relying on synchronisation to avoid interference and reduce planning complexity, are also more susceptible to interference from non-synchronised deployments.

20. We believe that all users in a band should be synchronised to avoid interference, enabling coexistence without the need for significant geographic separation, guard bands or additional filters[5]. All licences within a deployment region should apply the same frame and time synchronisation technical conditions (including accuracy assurance) as that applying to adjacent users and equipment sub carrier spacings as that for national MNO operators in adjacent bands to avoid interference.

[3] https://www.rsm.govt.nz/projects-and-auctions/consultations/msp-review-discussion-document-for-consultation/

[4] For example, Ofcom has used Administered Incentive Pricing (AIP) to provide efficient signals. Ofcom has discussed the AIP principles, amongst other places, at section 2 of its Spectrum Pricing consultation. https://www.ofcom.org.uk/__data/assets/pdf_file/0010/50014/spec_pricing.pdf

[5] This is discussed on the CEPT ECC report 296, summarised at page 3

21. Accordingly, we are concerned when we see proposals that rely on incompatible technologies and frame structures co-existing without tight planning controls[6], particularly proposals whereby incompatible operation is permitted except when interference is shown.

22. Interference management is complex and finding an interferer may not be as easy as, for example, someone broadcasting unlawfully in a band:

    a. If the transmission is raising the noise floor in a band due to unsynchronised or semi synchronised transmission, then the detection of such a rise of the noise floor will be highly problematic and fraught with difficulty. The increasing use of TDD may result in noise floor rise if the transmissions are un-synchronised or semi synchronised.

    b. Interferences that raise the noise floor are very hard to measure. Whilst the onus may be on the "aggressor", it is likely to be very difficult to prove this for remedial action.

23. Accordingly, a framework that permits non-standard deployments on the basis that interference will be remediated is likely to be contentious and will inevitably impact service performance for our customers.

24. We believe that the best approach is to design management rights such that interfering scenarios do not arise and to have tools to detect and confirm any instances of interference. Accordingly, as the Ministry plans to make long term decisions this year, we recommend that the work prioritise:

    a. Developing a common view across technical stakeholders on the interference risk of non-synchronised operation, and feasibility of any approach that relies on showing interference to apply remedies to interfering transmitters.

    b. Developing the framework for detecting and confirming interference from un-synchronised deployment scenarios that RSM anticipates licencing, this may include engaging in helping to identify and resolve disputed interference scenarios.

    c. Considering alternative approaches to promote synchronised deployment such as operator funding to deploy standard compliant technologies in specific cases. There are commercial incentives to deploy synchronised and standard compliant technologies:

        i. To mitigate interference.

        ii. In the case of MNOs and vertical networks, to access lower long run costs and innovation, and for planning/operational benefits as more small cells are deployed.

        iii. In the case of private networks, as they will in turn likely seek to also access standardised technologies and connect to standardised public networks (for network services or access outside their coverage).

    However, there are some niche cases where parties may not want to deploy standardised technologies and these cases need to be resolved. For example, WISPs have indicated that standardised equipment is expected to be too costly for their business model. Funding the transition cost of WISP equipment, for example,

[6] 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.

would likely result in more efficient use of spectrum and better outcomes than forcing unsupported co-existence. While it is unclear at this stage is whether specific funding is necessary. If so, the Ministry should ensure that it has the ability to fund any additional cost.

Existing technologies and users

25. New technologies can also be susceptible to interference from and to existing deployments. For example, US 5G deployments have led to concerns of potential interference to civil aviation radio-altimeters. The FAA is in the process of testing and approving radio-altimeter for use by airlines, but some legacy altimeters will require filters to be fitted. The filters currently fitted to these altimeters are no longer adequate for today's more intensive spectrum use. A similar interference issue would apply to satellite receivers that have "barn door" filters over the legacy C band.

26. There is uncertainty in the New Zealand framework in catering for technology change. The ITU regulations recommend that modern standard compliant technologies are deployed, and equipment used in a given part of the frequency spectrum should be designed to consider the technical characteristics of transmitting and receiving equipment likely to be employed in neighbouring and other parts of the spectrum[7]. Conversely, there is a strong principle in our framework that existing users are protected from interference or the mitigation of that interference, i.e., the second party must mitigate any interference on or from the existing deployment.

27. We agree that existing users should have protection from interference. However, it's unclear what protections an existing user should have – in interfering with or being susceptible to interference from a new user – when that susceptibility is due to the use of non-standard or legacy equipment.

28. We recommend that the Ministry consider providing advice on how it expects operators balance these competing interests, and review whether there are users in New Zealand where future concerns might arise, i.e., satellite receivers or any residual radio-altimeter issues that might be left unresolved by the FAA led process.

Licencing

29. Finally, we agree that the Ministry should consider licensing arrangements in light of the changing market. The increasing number of providers and transmitters deploying make planning and recording the location of transmitters even more important. The draft notes that the current arrangements anticipate a smaller number of licence holders (with aligned approaches and business models) and stations than are expected over time. The Ministry has already been asked to consider how in-building stations should be licenced in the context of the current model. Accordingly, we support reviewing licencing processes and fees.

30. In terms of fees, the Ministry should consider the feed paid by different industry segments including mobile in light of resources applied and number of licences registered. For example, the draft outlines the significant satellite related work and – if recovered on the basis of licences alone – satellite providers are unlikely to contribute to their fair share of costs.

[7] For example, see Article RR3-1 of ITU Radio Regulations

Accredited Radio Engineers (AREs)

31. We agree that the pool of people with a radio engineering discipline background is reducing and that this is a concern. If anything, given the technology change and complexity of planning issues, more AREs will likely be required by the industry. There are several key issues.

    a. New graduates now have a number of options from competing industries and sectors such as the IT sector.

    b. A number of industry planning roles do not require the same level of RF expertise – i.e., many plug and play wireless technologies that just work and can be deployed without a specialist technology understanding (Wifi and some IoT technologies) and simulation tools can lead to engineers providing outputs without a need to have a full understanding of fundamentals often required for detailed licencing activity – and this means the pool of specialist engineers is declining.

    c. Finally, spectrum engineering is a niche area in many organisations handled by a few key people.

32. Accordingly, we agree that investigating ways to build capability in the Radiocommunications sector including through the training of Approved Radio Engineers and Certifiers should be a priority.

Comments on proposed initiatives

33. The Ministry's proposed initiatives and our suggestions are set out below:

Figure 1: Table 2 RSM Summary of Work Plan Priorities

Priority RSM Work Programme Items	Spark Comment
Band planning and technical studies (eg use, technical requirements)	
1. Review and re-plan the 24-30 GHz band including technical consultation	We agree that this is a priority. However, we have already submitted to the Ministry on our concern that parts of this band that MBIE has proposed to allocate to ESIMS and other satellite services - in particular the 27.5-29.5GHz range - have in other major markets been adopted for terrestrial mobile broadband systems. The final allocation should be informed by a review of how the Ministry should balance competing demands, and what pricing signals can be applied to GUL licences.
2. Review and re-plan 600 MHz spectrum, including technical consultation	We agree with MBIE. There is a need to have clarity on how much spectrum will be made available, the impact of this on DTV and wireless mobile phones needs to be clarified. This band, though, will be critical for rural broadband service improvement, and so this work should be expedited.
3. Review and re-plan 600 MHz, 3.3-3.4 GHz, 3.4-3.8 GHz and potentially 3.8-4.2 GHz bands, including technical consultation	We agree that the bands listed here need to be replanned.

Priority RSM Work Programme Items	Spark Comment
	Earth stations must be removed from the 3.4-3.8 GHz band. The frequencies for this earth station could be relocated to 3.8 - 4.2 GHz. Some jurisdictions overseas are now consulting and considering opening up more spectrum in the C band, especially 3.8 - 4.2 GHz. We support MBIE doing a technical consultation for the best use of this spectrum. At the moment it is only lightly used in NZ.
4. Investigate use of 6 GHz for Wi-Fi 6E	In MBIEs consultation on the 6GHz band for WiFi-6E we had submitted that this band should be used for licenced IMT- certainly 6425- 7125 Mhz. This study should not assume that wi-fi is the likely future use of this band.
5. Investigate multigigabit wireless systems in the 66 -71 GHz range	support
6. Commence planning work for spectrum bands where management rights are due to expire from 2028.	support
Allocation design and implementation	
7. 5G spectrum - detailed consideration of allocation of spectrum rights: 3.3-3.41 GHz, 3.5 GHz, 3.8 -4.2 GHz and 24-30 GHz bands for 5G and associated technologies	See our comments above. The Ministry has further consulted on the basis of a 3.3-3.4 rather than 3.41 band.
8. Investigate ways to get more use out of the radio spectrum and adopt tighter spectrum practices	As set out above, we recommend that MBIE consider how to balance competing interests across GUL and MR frameworks. Support but MNOs are obliged to adopt deployments that are approved in 3GPP standards. We cannot deploy a non-standard solution in NZ
9. Consider spectrum sharing, tiered and dynamic access mechanisms for 5G and other allocations	Again, as set out above this should consider the practical implementation of sharing models where non-synchronised technologies are used.
10. Consider the effect of spectrum sharing frameworks on market dynamics and competition	
11. Consider if the Radio Communications Act enables or constrains access arrangements and spectrum sharing	
12. Progress implementation of decisions on the 1700-2300 MHz band.	support
13. Review the rules for the 22575 MHz – 2620 MHz Managed Spectrum Park for the remaining 7 years	There is a typo, it should be 2575- 2620 Mhz. we suggest MBIE should clarify the usage conditions for MSPs and WISPs and in some cases their coverage extends to the business areas of MNOs

Priority RSM Work Programme Items	Spark Comment
14. Review use of Managed Spectrum Park concepts in general, and for regionally-based operators and how such models (and other sharing models) could be applied in high demand and higher bandwidth spectrum	See above
Regulatory management and administration	
15. Assisting New Zealand Space Agency on issues as they arise.	support
16. Providing information on New Zealand regulatory settings to satellite service providers.	But there is no need to notify base stations with AAS to satellite providers
17. Continue to run the ITU-R Satellite Co-ordination process and keep PIBs up to date (eg PIB 60)	
18. Scope issues and develop proposals to modernise the Radiocommunications Act 1989	Support. The Act is dated and old and is in need of updating, especially as systems using AAS rely on TRP co-ordination and not EIRP
19. Continue to proactively engage in ITU and international trade issues relating to spectrum.	
20. Develop and implement revised operational approach to small cell network licensing	
21. Develop options for law enforcement agencies regarding use of wireless electronic counter measures and associated technologies	
22. Update government policy statement for radio licencing	
23. Consider updates to General User Licences, particularly for short-range devices	
24. Review the Radio Spectrum Licensing Fees regime in 2023	
25. Investigate ways to build capability in the Radiocommunications sector including through the training of Approved Radio Engineers and Certifiers	
Monitoring priorities	
26. Monitor developments in satellite technology and use of new satellite bands (eg Q&V bands)	
27. Monitor international developments on telemetry, short messaging, and low-data-rate IoT satellites	

Priority RSM Work Programme Items	Spark Comment
28. Monitor international developments on 40 GHz mmWave, particularly 40.5 -43.5 GHz	support
29. Monitor developments and sharing arrangements in 3800 – 4200 MHz	support
30. Monitor developments in 1 427-1 518 MHz and consider how this could be made available	This spectrum could be made availability now under the current framework. This should be considered further, and can then be reflected in further policy advice.
31. Monitor developments in 6 425 - 7 125 GHz mobile/wi-fi	See above. This spectrum should preferably be used for licenced IMT. This spectrum should move from monitoring to active planning.
32. Monitor developments in new 6G mobile technology and next generation technologies and standards	Support. NZ should support a future AIO for WRC 23
33. Monitor international developments in spectrum sharing, tiered and dynamic access mechanisms for 5G and other allocations	
34. Monitoring sector needs, training and qualifications for radio specialists	

Other areas that should considered

DSRC spectrum

34. Govt should consult and open the DSRC spectrum DSRC spectrum This is a first step towards spectrum for spectrum for autonomous cars. It should be note that in 4G and 5G CV2X will work in conjunction with DSRC.

Rail communication

35. The spectrum outlook notes spectrum is needed for rail communication. 3GPP is standardising spectrum for this application as the technology must support high Doppler frequencies that will arise with fast moving trains.

[End]