Vodafone response to Radio Spectrum Management's discussion document on 24-30 GHz use in New Zealand

10 June 2021

Introduction

1. Thank you for the opportunity to provide our views on the Ministry of Business, Innovation and Employment's (**MBIE**) discussion document on 24 – 30 GHZ spectrum use in New Zealand.
2. New Zealand has an immediate opportunity to become a global 5G leader and to ensure world class connectivity is accessible to all. Ensuring that spectrum policy supports widespread competitive 5G deployment is therefore vital.
3. Vodafone New Zealand Limited is one of Aotearoa's leading digital services and connectivity companies, and we believe every New Zealander will thrive with access to the world's best digital services. We offer almost 3 million connections to Consumer and Business customers. Vodafone is owned by Infratil and Brookfield Asset Management and remains a partner market in association with Vodafone Group, one of the world's largest telecommunications companies. For more information, please visit www.vodafone.co.nz.

Executive summary

4. Vodafone is establishing 5G networks across Aotearoa, providing the platform for harnessing new technologies that are poised to be one of the solutions to some of today's most pressing challenges, from climate change to lagging productivity. The introduction of 5G will see new technologies like the Internet of Things (IoT) move from a data-centric service to a control-centric service. This means that the ever-growing volume of data being produced by IoT devices will increasingly inform decision making, which will in turn drive efficiencies across operations and industries. The unique combination of high bandwidth, low latency and quality control will enable organisations to do more with their resources, putting mobile operators at the heart of this new age of industry.
5. Research shows that the rollout of 5G in New Zealand could add between $5.7bn and $9.9bn to the economy over the next decade, with new digital business models that utilise 5G capabilities predicted in almost all industry verticals. The technology will also help foster greater digital inclusion by enabling community benefits such as improved health, education and social outcomes.
6. Parts of the 24 – 30 GHz frequency band, also referred to as **mmWave spectrum**, will play a crucial role in providing capacity for 5G networks. For New Zealanders to access the best possible 5G network experience, national Mobile Network Operators (**MNOs**) (and the Mobile Virtual Network Operators (**MVNOs**) who also use their networks) will require sufficient bandwidth in this category.
7. We are broadly supportive of the spectrum allocations proposed by MBIE and agree that 24.25 – 27.5 GHz band should be allocated exclusively for IMT use on a national management rights basis.
8. However, our view is that the government needs go further and also allocate 27.5 – 28.5 GHz (the lower part of the 27.5 – 29.5 GHz band) exclusively for IMT use on a national management rights basis.
9. In order to realise the full technical potential of current and future 5G technology, national MNOs need to be allocated 1GHz each in the mmWave band. Allocating the entire 24.25 – 28.5 GHz frequency band for IMT use would enable this distribution, in addition to meeting the needs of regional MNOs and any new market entrants.
10. There needs to be symmetric regulation of all telecommunications providers, as currently fixed satellite broadband providers are effectively using radio spectrum for free. MBIE's consultation should make clear that satellite providers will not access spectrum on terms and costs that are more favourable than those offered to MNOs.

11. We have set out our responses to selected questions included in MBIE's discussion document below.

Our position

The technologies and applications in 24 – 30 GHz

Q1. What are the most likely use cases in New Zealand for mmWave based 5G services?

12. The 5G mmWave frequencies offered by 24 – 30 GHZ spectrum will materially assist MNOs in meeting exponentially increasing demand for high-quality mobile connectivity and facilitate exciting new use cases. mmWave spectrum delivers large capacity over short distances. It also enables substantial expansion of coverage and capacity (including through massive MIMO, which groups together antennas at the transmitter and receiver to enhance throughput and spectrum efficiency).
13. The practical applications of mmWave spectrum include:
    a. Enhanced fixed wireless access (**FWA**) services delivering higher capacity and service quality, including in regional New Zealand.
    b. Industrial and enterprise connectivity, including in manufacturing scenarios where precision processes supported by low latency are required. Potential gains include higher levels of automation, adoption of new processes and improved industrial process and productivity.
    c. Coordinated movement of goods and logistics, connected transport environments, connected cars and public transport systems and intelligent transportation systems.
    d. Remote control and monitoring of machinery, improved worker safety, remote diagnostics and improved monitoring systems.
    e. In healthcare, augmented distance learning and training remote participation of experts during procedures, remote diagnostic services, enhanced access to access to medical services in rural.
14. Cumulatively, these applications can deliver significant innovation and productivity gains for New Zealand businesses and consumers. To ensure optimised operation of the mmWave 5G network, availability of sufficient and interference-free spectrum is essential.

Q4. Do you think the existing fixed service licenses in 26 GHz can be migrated to the 23 GHz and/or 38 GHz fixed service bands?
Q5. If not, do you think the existing fixed services should be allowed in the 26 GHz?

15. Vodafone has many fixed links operating in the 26 GHz band. These links are used for cell site backhaul and are critical for us to maintain reliable cellular services.
16. It is technically possible to migrate these existing links to 23 GHz or 38 GHz. However, this would require replacement of microwave equipment, which will incur significant cost, resources and time, similar to that required for building a new microwave link.
17. RSM have previously offered to extend the licences for Vodafone's existing fixed links in the 26 GHz band until the end of July 2023. This is not enough for Vodafone to migrate all of our links off this band and we will require until at least October 2027 to migrate these links to other bands or technologies.
18. For new fixed links, it is possible to use the 23 GHz, 38 GHz and other fixed service bands. However, there may not be sufficient capacity in these bands if demand for such links is high. RSM should monitor the demand for wireless fixed links and allocate more bands for fixed links as required.

24.25 – 27.5 GHz

Q6. Do you agree New Zealand should allocate 24.25 – 27.5 GHz primarily for IMT use?

19. We support the MBIE's proposal that the entire 24.25 – 27.5 GHz frequency range should be allocated for IMT use **exclusively** on a **nationwide** basis.

Q7. How should RSM accommodate other use in this band such as space services?

20. Vodafone does not recommend allowing other services to share this band with MNOs, even on a secondary basis.
21. Allowing any other services to use this band on a shared basis has the potential to introduce interference and severely impact 5G service quality. It will make network planning and operation much more difficult, constrain the enhancement of 5G services, add to operators' administration and compliance costs, and slow the deployment of applications that use mmWave spectrum. Other services would also likely to be compromised due to mutual interference issues.
22. To avoid interference and ensure the quality of mmWave 5G network, RSM should allocate the 24.25 – 27.5 GHz range exclusively for IMT use on a national basis, similar

to other frequency bands allocated for MNOs in the past (e.g. 700 MHz, 900 MHz, 1800 MHz, etc).

27.5 – 29.5 GHz

Q8. How do you see our proposal of the 28 GHz band allocation?

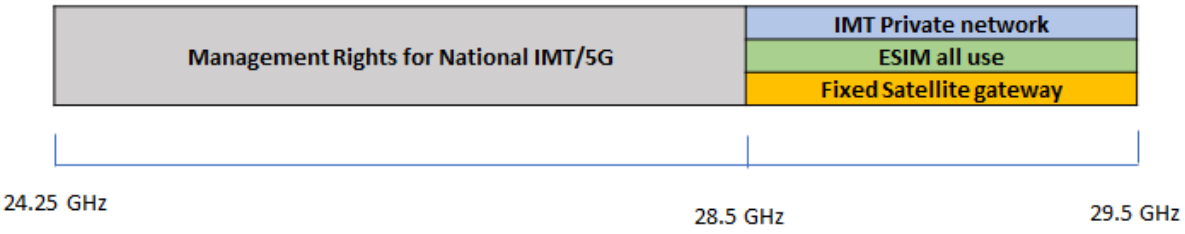
23. Our view is that 24.25 – 27.5 GHz is not sufficient to achieve optimal deployment of 5G networks. Therefore, we propose that 27.5 – 28.5 GHz should also be allocated **exclusively for IMT use** on a nationwide basis.
24. Allocating the full 24.25 – 28.5 GHz exclusively for IMT use will provide 4.25 GHz of spectrum in total, which will enable:
    a. The three existing national MNOs to obtain 1 GHz of spectrum each in the mmWave band.
    b. Local/regional MNOs to obtain 400 – 800 MHz each at reasonable cost.
    c. Sufficient spectrum for other interested parties, aligning with provision for such parties that RSM has made when allocating other spectrum bands, e.g. 3.5GHz. It is important for RSM to take into account that the market could change in the future with new operators requiring spectrum – this should be provided for during this initial allocation process.
    d. Access to sufficient spectrum to enable all MNOs to enhance and expand 5G mobile services for the benefit of New Zealand industry and consumers.

    4.25 GHz will provide sufficient spectrum for the above uses without the risk of a bidding war which would artificially inflate the spectrum cost to the detriment of network investment.
25. 1 GHz of mmWave spectrum is needed for each MNO in order to realise the full technical potential of current and future development of 5G technology. In particular:
    a. It would provide greater user throughput and cellsite capacity. The short wavelength at this frequency enables the building of massive MIMO antennas at a practical size and reasonable cost. Such efficiencies are critical in realising the full benefits of 5G.
    b. It would allow mobile operators to meet the capacity requirements associated with Fixed Wireless Access (FWA) services, as the major portion of 5G FWA will be offered on the main 5G mobile networks.
    c. It will enable MNOs to offer customer slices with sufficient capacity that provide dedicated virtual connection to different applications and customers. This will enable many new types of commercial and industry use cases.

26. In addition, the 28 GHz band has the advantage of being deployed earlier than the 26 GHz band and has a more developed ecosystem. Therefore, allocating more of this band for IMT use (i.e. 27.5 – 28.5 GHz) in New Zealand would encourage and support early implementation and adoption of mmWave 5G technology. Conversely, not allocating the 28Ghz band to IMT uses would hamper and slow timely deployment of enhanced 5G services by MNOs.
27. Our view is that it is not justifiable to allocate the entire 27.5 – 30 GHz frequency range on a primary basis for FSS, ESIM and other satellite-related use because the current and potential on-land use of these services is limited in New Zealand. It is also worth noting that no other major country is allocating this much frequency for satellite use in this band. It would be much more efficient to allocate some of this frequency range to MNOs that could utilise the spectrum much sooner for the immediate benefit to the country.
28. Reserving spectrum for possible but inherently speculative future use by possible new (satellite) users carries a significant risk of the spectrum laying unused, being inefficiently used or simply being speculatively acquired. Any of these situations result in poor outcomes for consumers and New Zealand as a whole. The potential and uncertain benefits of allocation for new users and services they may or may not deploy must be carefully considered against the inarguable benefit of allocation on existing providers of essential connectivity, and the clear roadmap of service enhancements that these operators have in plan.

Q9. Which option do you prefer for allocating 28 GHz band? Or is there any other option for managing the shared use of IMT, ESIMs and FSS in the 28 GHz band?

29. As outlined in the previous section, we propose allocating 24.25 – 28.5 GHz exclusively for IMT use on a nationwide basis and allocating 28.5 – 29.5 GHz on a shared basis for FSS, IMT private network and ESIM, as illustrated in below graph:



Q10. If you prefer option 1, do you agree with the proposed sharing mechanism (defining satellite coordination zones) between IMT use and FSS ground stations?

30. For the spectrum to be shared between FSS, ESIM and IMT, the proposed satellite coordination zones provide a valid sharing mechanism. However, further study may be required to clarify the methods and parameters for defining the coordination zones, as well as defining a clear process to manage the licensing for various services.

Q11. If you prefer option 2, how much spectrum do you think RSM should allocate to ESIM, IMT private network/FWA? And what's the preferred spectrum placement?

31. As outlined previously, we propose allocating the 28.5 – 29.5 GHz range on a shared basis for ESIM, IMT private network and FSS use. The ESIM services can remain operating under a General User Radio Licence (GURL), while FSS and IMT private network can operate under a licence scheme similar to the Radio Licences regime on a first-come-first-serve and fee-paying basis. Any new radio licences for FSS gateways and IMT private network can be coordinated using the coordination zones method as suggested by RSM.

29.5 – 30 GHz

Q13. Do you agree that the current satellite allocation and licensing regime for 29.5 – 30 GHz should remain?

32. The new generation of fixed satellite broadband providers, such as Starlink, offer an alternative for connectivity in the hardest-to-reach parts of New Zealand. However, we note that under the current licencing regime, these satellite companies are effectively using radio spectrum for free. As large overseas companies offering fixed satellite broadband become more established in the New Zealand market, the direct competition with domestic MNOs that operate 4G and 5G networks will increase. As such, there needs to be symmetric regulation for all providers. Instead, fixed satellite broadband providers currently have a significant cost advantage over MNOs.
33. There is no justification for MNOs to face an unequal cost structure for spectrum access than is faced by satellite operators, particularly when the wider economic contribution of MNOs and the regulatory framework they are subject to as domestic connectivity providers is taken into consideration. Any allocation methodology must also recognise that spectrum costs faced by MNOs will impact directly on the funds available in invest in actual networks and services.
34. There are a few possible licence options that would help level the playing field by bringing the spectrum cost per customer or spectrum cost as the portion of relevant revenue on par with the system for the IMT MNOs. These include:

a. Licencing individual user equipment on an annual fee basis
b. A one-off fee similar to what MNOs pay for using the cellular spectrum

Licensing Options

Q14. What's your preferred licensing option in 26/28 GHz spectrum?

35. For the 24.25 – 28.5 GHz band, the MNOs and other interested and relevant parties should be allocated national management rights for 20 years, in multiples of contiguous 200 MHz blocks, to a cap of maximum 1 GHz total spectrum for each operator. The allocation can be through a typical spectrum auction or by direct assignment. While spectrum allocation to date has generally occurred through auction, direct allocation has recently occurred for 3.5 GHz spectrum. Direct allocation can provide a more efficient route for operators to secure necessary spectrum, avoiding the transaction costs associated with auction processes and providing higher certainty in terms cost and within-band allocation. Our view remains that if government values speeding up actual use of spectrum, i.e. building networks that use mmWave and deploying services that use it, more highly that maximising revenue then direct allocation has merit.
36. For the 28.5 – 29.5 GHz band, the allocation for FSS and IMT private networks can be based on a first-come-first-serve, fixed-term, localised licensing basis that is similar to the current Radio Licensing regime, but with either a one-off or an annual licensing fee that is comparable to the spectrum cost per customer, or spectrum cost as the portion of relevant revenue, to that of IMT use in the 24.25 – 28.5 GHz national management rights. Deployment obligations should also apply to the licences on a "use it or lose it" basis for all parts of the frequency in any areas to avoid spectrum being held unused by any party.
37. All interested parties, including MNOs, should be allowed to apply for licences in the shared FSS and IMT private network band. This will ensure sufficient resources, competition and expertise can be invested in this new segment, including by MNOs who will have higher incentive to access this band to innovate or deliver specific projects, the scope of which can be addressed via licence conditions.
38. The ESIM can operate under a GURL in the shared 28.5 – 29.5 GHz band but should also attract a fee of similar nature and amount.

Q15. Do you see any need for general user licence spectrum for IMT? If so, what use case might there be?

39. Our view is that IMT services should *not* operate under general user licence in order to better manage potential interferences between different applications and users.

Q16. If there is a need for general use spectrum for IMT and ESIM, how much spectrum should we set aside for it? Should RSM mandate technical conditions on the general use license?

40. If a general user licence is created for any services, RSM should mandate technical conditions, as well as dispute management processes to minimise interference potential and resolve any technical issues that may arise from interference between different users in a timely manner.

Technical Considerations

Q18. Do you agree RSM should refer 3GPP standards to set the regulatory requirements for spectrum allocated to IMT

41. Vodafone supports RSM adopting 3GPP standards to set the regulatory requirements for all spectrum allocated to IMT for all mmWave band.

Q19. Should we introduce a break point for MR technical conditions mid-way through the duration of the MR? Or is it sufficient to set AFELs based on current technology and standards only?

42. Vodafone does not oppose introducing a break point for MR technical conditions mid-way though the duration of the management right.

Q20. Do you agree RSM should mandate equivalent ETSI harmonised standards for radio licences in Radio Standards Notices and review these standards regularly?

43. While ETSI harmonised standards are generally supported by the industry world-wide, there are some parts that are created specifically for the CEPT situations which may not be suitable or applicable to New Zealand. Therefore, RSM need to be careful when adopting ETSI standards to ensure no unnecessary limitations or requirements are imposed to New Zealand usage.

Q24. Do you agree that we should we implement (e.g. through UELs and AFELs) the ITU Radio Regulations, Resolution 750 limits, including the 1 September 2027 transition date and grandfathering clause for the protection of the EESS (Passive) Band? If not, please explain what limits and transition dates you consider to be more appropriate.

44. Vodafone supports RSM implementing ITU Radio Regulations, Resolution 750 limits, including the 1 September 2027 transition date and grandfathering clause for the protection of the EESS (Passive) Band.
45. RSM should not bring the transition date forward to an earlier date.

Q26. Do you agree with RSM's position to not establish a framework for coordination zones for RAS?

46. Vodafone agrees with RSM's position to not establish a framework for coordination zones for RAS.

Q27. Do you see a need for RSM to allow EESS and SRS earth stations to operate in the band?

47. Vodafone's view is that there is no need to allow EESS and SRS earth stations to operate in the 25.25 – 27 GHz band.

Q28. Do you agree a semi-synchronised or unsynchronised network should be used in 5G high band deployment?

48. Vodafone's view is that it is important to eliminate potential interferences caused by unsynchronised TDD networks. We propose that synchronisation is mandated for the following usages:
    a. Usage in the national MR bands in the 24.25 – 28.5 GHz band (or 24.25 – 27.5 GHz as proposed by RSM), including all the usage by all MNOs and any future operators.
    b. Any outdoor IMT usage in the shared IMT/ESIM/FSS band in the 28.5 – 29.5 GHz range (or 27.5 – 29.5 GHz as proposed by RSM for shared usage). The usage in these bands should be synchronised with the IMT usage in the national MR bands, as well as synchronised with other usage in the shared range.
49. Indoor IMT usages in the shared IMT/ESIM/FSS band in the 28.5 – 29.5 GHz range (or 27.5 – 29.5 GHz as proposed by RSM for shared usage) can be semi-synchronised or unsynchronised.
50. The synchronisation parameters should be agreed by the operators and RSM.

Q31. Do you agree that RSM should implement ITU Radio Regulations, Resolution 242, resolves 2.1 in the management rights and licences conditions? If not please explain why or propose an alternative?

51. Vodafone believes it is unnecessary for RMS to implement ITU Radio Regulations, Resolution 242, resolves 2.1 in the management rights and licence conditions.
52. In normal cellular network planning, it is the industry's best practice to design outdoor cell sites so the antenna beams are at or below the horizon in order to achieve best coverage and interference management. It is only under very special circumstances that a cellular antenna may be installed to have its main beam points above the horizon. Such cases are very rare for any MNOs so it is unlikely to cause interference to space stations.
53. If this result is mandated, it will make it illegal to have antennae that are pointed above horizon, making it difficult for certain design scenarios, with very little actual benefit to space station protection.

Q32. Do you see a need for RSM to allow continued FSS gateway access to 27.0 - 27.5 GHz on a case by case basis? If so, how should we coordinate FSS Earth stations and IMT?

54. Vodafone sees no need to allow continued FSS gateway access to 27 – 27.5 GHz, and we believe RSM should not allow continued FSS gateway access to this frequency range.
55. As stated in the consultation document, ITU-R studies show that to allow shared FSS use in this band, the coordination zone radius around RSS earth stations may need to be up to 10km. This would create significant difficulties in introducing mmWave 5G services in areas around the FSS earth station.
56. RSM have previously decided not to extend the existing FSS licences in the 27 – 27.5 GHz beyond 31 January 2022 and have given the licensees sufficient notice. RSM should ensure that no future use by FSS is allowed in this band so interference-free 5G services can be implemented in all parts of New Zealand.

Q33. Do you have any comments regarding the spectrum sharing approach proposed by RSM between FSS and IMT FWA in the 28 GHz band?

57. Vodafone believes the options proposed by RSM are sensible and sufficient in managing the sharing of FSS and IMT usage in the 28 GHz band.

Q34. If RSM were to apply an EIRP limit on horizontal plane for FSS, what is the maximum EIRP value we should assume?

58. Vodafone believes further study is required to determine the EIRP value.

Q35. Which option do you prefer for arranging the existing fixed service in the 26 GHz band?

59. Vodafone have many fixed links operating in the 26 GHz band. These links are mainly used for cell site backhaul and are critical for Vodafone to maintain reliable cellular services.
60. To migrate these links to 23 GHz or 38 GHz requires replacement of relevant equipment, which will incur significant cost, resources and time, similar to that required for building a new link.
61. RSM have previously offered to extend the licences for Vodafone's fixed links in the 26 GHz bands to the end of July 2023. Vodafone requested those to be extended to October 2027, so we have sufficient time to migrate these links to other bands or technologies.

Q36. Do you think RSM should mandate the regulatory requirements as laid out in Resolution 169 (WRC-19) for ESIM use if a shared use between 27.5 – 28.35 GHz?

62. Vodafone supports mandating the regulatory requirements as laid out in Resolution 169 (WRC-19) for ESIM use if a shared use between 27.5 – 28.35 GHz is offered.

Our recommendations in summary

63. In summary, we make the following key recommendations for the 24 – 30 GHz use in New Zealand:

    a. Allocate 1GHz for each MNO in the 24.25 – 28.5 GHz frequency band exclusively for IMT use on a national management rights basis.
    b. Allocate 28.5 GHz – 29.5 GHz for FSS, IMT private network and ESIM on a first-come-first-serve, fixed-term, localised licensing basis that is similar to the current Radio Licensing regime.
    c. Level the playing field between MNOs and fixed satellite broadband providers in relation to the cost of acquiring and using spectrum.

Contact

Questions regarding this submission should be directed to:

Tom Thursby
Lead Counsel and Head of Public Policy
Vodafone New Zealand Limited
029 7733654 *tom.thursby@vodafone.com*

Kamile Stankute
Senior Public Policy Advisor
Vodafone New Zealand Limited
021 439311 *kamile.stankute@vodafone.com*

Eric Liu
Principal Architect – Spectrum and mobile access
Vodafone New Zealand Limited
021 378 757 *eric.liu@vodafone.com*