24 – 30 GHz use in New Zealand

Submission | RSM

10 June 2021

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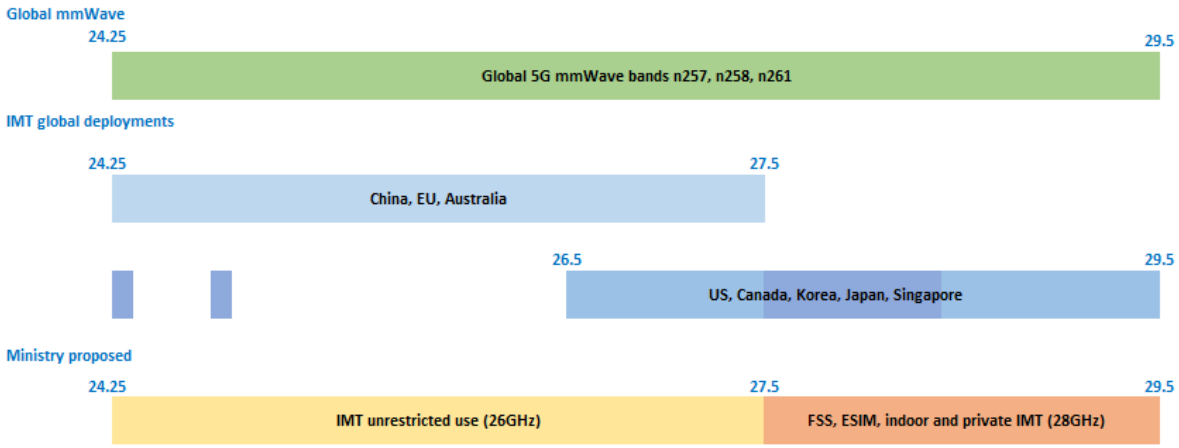
Executive Summary

Thank you for the opportunity to comment on your 24 – 30 GHz use in New Zealand discussion paper (**the discussion paper**).

We support proposals to allow little-used licences and management rights to lapse and to reserve the band primarily for IMT and satellite system use. This is a key 5G mobile band that – as set out in Figure 1 – is increasingly supported by major economies and vendors. Any mobile network provider will need access to large mmWave bandwidths of around 1000 MHz in order to support ITU specified services.

Figure 1: mmWave bands, global deployments and proposed assignment



However, there are over-lapping and conflicting requirements from satellite and IMT providers. While largely discrete bands were used in the past for mobile and satellite applications, mobile technologies are now able to use higher frequencies typically used by satellite providers. Conversely, satellite systems now aim to compete with terrestrial mobile access services. Spectrum planning should aim to be competitively neutral and ensure best use of available spectrum.

The discussion paper highlights this tension. On one hand, the paper proposes to reserve the full 28GHz band for satellite systems with little – if any - consideration of expected end user demand. The proposed reservation implies, on the face of it, an implausible stepwise change in New Zealand end user demand and supporting infrastructure. Authorities in larger and more dense markets such as South Korea have reserved less spectrum for satellite systems in this band.

On the other hand, the proposal would limit New Zealand 5G IMT deployment to frequencies below 27.5GHz with potentially material implications for 5G deployment in New Zealand:

- Limiting mobile operators to spectrum below 27.5 GHz (n258) would leave insufficient usable bandwidth spectrum for all IMT based access seekers to support ITU IMT 2020 service specifications and increase operators' costs. Spectrum below 24.75 GHz is likely to only be useful for reduced power systems (to meet OOBE limits set during WRC 19) deployed for indoor or private networks to protect weather satellites.

- We forgo the option of aligning our technology transition to 5G powerhouses such as the US, South Korea, Japan and Singapore. These economies are driving early mmWave deployment and vendors are focused on technologies consistent with the n257 band. There is an overlap between this band and the Ministry's proposed band in the 26.5 and 27.5 GHz range but, in light of Treaty of Waitangi and other possible claims, there is uncertainty

relating to how much – if any – of this overlap will be available to mobile operators. Either way, there will not be enough spectrum in this band to ensure all three mobile network operators can use n257 band equipment.

- There is also regulatory uncertainty regarding the availability of n258 based equipment due to Art 21.5 discussions in the ITU that are unlikely to get resolved before WRC 23, and this would likely impact technology availability and economies of scale for this band.

Ideally the Ministry would balance these competing uses and uncertainties 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 demand expectations. If this approach is not available to us the Ministry should consider other options that can achieve the same outcomes.

We believe that this means - in the absence of proven satellite end user demand – allocating the band on the basis of:

- 24.25- 24.75 GHz to IMT private networks (i.e. in band n258 for private and in-building deployment).
- All of spectrum 24.75- 28.35 GHz for IMT use (i.e. the remaining n258 and part of n257) without any deployment restrictions.
- 28.35 - to 29.5 GHz for FSS GSO and NGSO feeder links and ESIMs, and
- 28.35 to 28.85 GHz reserved without use specified for possible future expansion.

If satellite system and ESIM operators can demonstrate New Zealand end user demand for their services, then the Ministry should consult further on

- An allocation that meets expected New Zealand satellite system demand, balanced against the costs imposed on IMT deployments.
- Specific satellite deployment conditions and licences that provide incentives to reveal true preferences and demand.

Infrastructure investors in any market require regulatory frameworks to be predictable and equitable – frameworks that let the Government interfere with, or steer, market outcomes lead to reduced investor confidence and poorer infrastructure outcomes. We are concerned at the differential treatment the proposal applies to mobile network operators and satellite operators, and at the limited consideration given to this by the Ministry.

As set out above, satellite and mobile network operators are increasingly competing with each other in digital markets. 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.

This proposal further illustrates this differential treatment. We expect it should prompt deeper consultation with the satellite and mobile industries to identify options for addressing unequal treatment and ensuring our country's scare spectrum is allocated to its highest possible uses.

Introduction

1. Thank you for the opportunity to comment on the Ministry's 24 – 30 GHz use in New Zealand discussion paper (**the discussion paper**).

2. The band is currently planned for a mix of fixed and satellite services. The Ministry proposes to allow little-used LMDS management rights (**MR**), vehicle radar licences and point to point links to lapse. RSM proposes to then allocate the 26 GHz band for mobile operators IMT services, and shared use of the 28 GHz band by IMT indoor or private users, FWA, fixed satellite services (**FSS**) and earth stations in motion (**ESIM**).

3. We support RSM proposals to clear under-used licences and MR from the band:

    a. Assigning the 24.25GHz – 27.5 GHz band (**26GHz band**) to IMT - this is a key 5G band and aligns us with major economies, and

    b. Providing for shared use of the 27.5GHz – 29.5 GHz band (**28GHz band**).

4. However, there are potentially significant opportunity costs associated with proposals to reserve the full 28GHz band for satellite systems as this would limit IMT access to an important global 5G band supported by major economies and an extensive technology eco-system.

5. In our submission we:

    a. Set out the tension between competing IMT and satellite uses and a proposed way forward.

    b. Provide a proposal for supporting shared use of spectrum, and

    c. Comment on technical characteristics of the proposal.

Spectrum allocation

6. We support the Ministry's proposals to clear under-used licences and MR from the bands and to make the spectrum available for IMT and satellite systems.

7. As noted in the paper, these bands are used for both IMT and satellite systems (Figure 3):

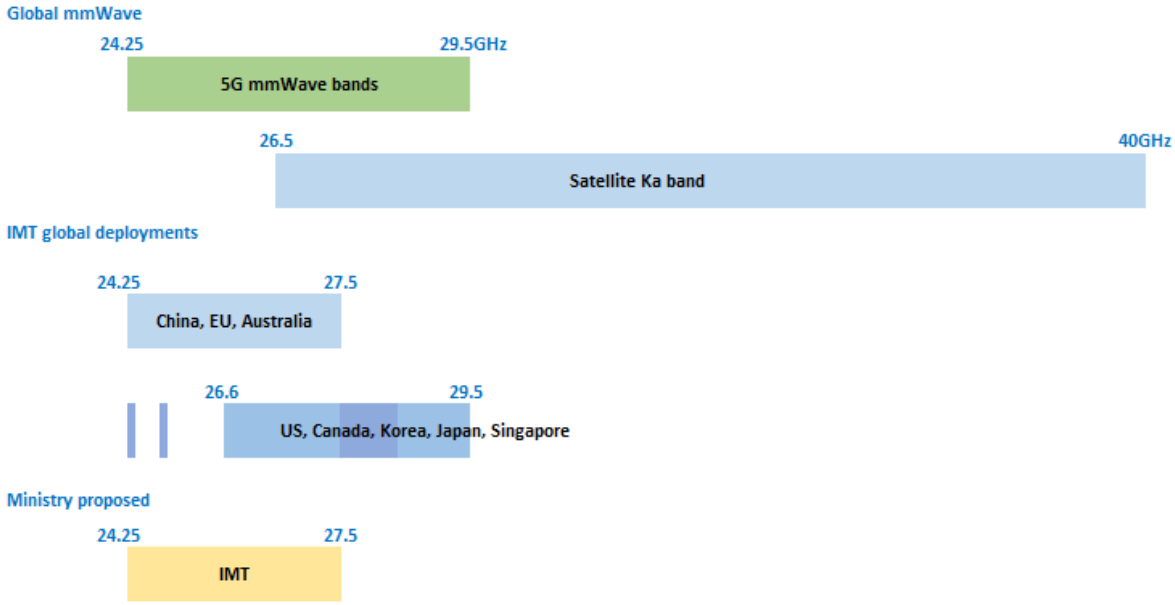
    a. The 26GHz band (24.25- 27.5 GHz) was identified for International Mobile Telecommunications (IMT) at World Radiocommunications Conference (WRC) 2019 and the ITU Radio Regulations were updated (see Edition of 2020).

    b. The 28GHz band (26.5- 29.5 GHz) is commonly used by satellite, mobile and fixed services worldwide. It is also planned for use by 5G services by a number of countries.

    Although IMT 28GHz band deployment was not a study item in WRC-19, the band has been specified by the third Generation Partnership (3GPP) as n257 (26.5 - 29.5 GHz) since its first 5G standards release (Release 15).

    c. This frequency range is part of the Ka band (26.5 - 40 GHz) which is the key satellite spectrum used currently for earth stations, gateways and ESIM.

Figure 3: 26GHz, 28GHz, and satellite Ka band



IMT and satellite systems have over-lapping and conflicting interests

8. As set out in the discussion paper, there are over-lapping and conflicting interests in this band.

9. IMT demand for mmWave spectrum reflects:

    a. That these are important global pioneer bands for 5G IMT services with technology development focus.

    b. That it is vital that any operator (incumbent or new) with 5G aspirations has the opportunity to access some spectrum in either or both of these bands to participate in deploying the next phase of very high speed and low latency 5G services.

    IMT providers will need spectrum in low and medium bands, and around 1000MHz each of mmWave band spectrum in order to deliver the 3GPP defined service performance[1], and

    c. Demand from new or additional IMT applications and providers, including indoor deployments, industry verticals and Iwi.

10. While satellite system demand reflects a much less-certain future:

    a. The bands have been used, in part, for satellite “feeder” links - i.e. earth to satellite connections to the core network - and mobile satellite stations for aircraft, trains and ships when out of range of terrestrial networks.

    b. Satellite system spectrum needs are based on actual end-user demand. The consultation paper does not set out the basis for concluding that the full band should be reserved for satellite systems. While the New Zealand demand for satellite-based services is uncertain, we believe that in all cases the actual demand is unlikely to justify the full allocation of the 28GHz band to satellite systems.

[1] Recommendation ITU-R M.2083 for 5G vision and the Report ITU-R M.2410 addressing 5G technical performance requirements, bandwidths of hundreds of MHz up to at least 1 GHz are essential for 5G services.

11. These interests in the band inevitably require the Ministry to consider the competing uses in ensuring spectrum is allocated to its best use.

12. In the past, there were largely discrete bands for mobile applications and for satellite applications, serving complementary purposes and markets such as the satellite provision of backhaul and end-user services where terrestrial services are not viable. In the radio regulations mobile and fixed satellite have sometimes co-primary and sometimes primary and secondary status but typically in the past bands for mobile applications and bands for satellite applications have been different. However, mobile technologies are now able to use the higher frequencies used by satellite providers in the past. One of the key 5G technology benefits is that operators are able to access more spectrum bandwidth to support 5G specification capacity and services.

13. Conversely, satellite systems today are aiming to compete with terrestrial mobile systems. This is a different use from what satellite systems were used for previously – i.e. predominantly for international linking and broadcast – and authorities reserved spectrum for satellite on that basis.

14. We support the Ministry's proposed approach that considers demand from IMT and satellite across the full 24 – 30GHz range. Considering the applications discretely is unlikely to maximise spectrum outcomes, nor promote efficient competition.

Proposed allocation of the 24 – 30 GHz band

15. Ideally the Ministry would apply a market-based approach to auction the contended spectrum, ensuring spectrum is deployed to its highest use and encouraging spectrum holders to reveal their true preferences and requirements. For example, auctions, reserve prices and implementation obligations are means of forcing parties to reveal their true preferences relating to expected demand and spectrum use or value.

16. However, if this approach is not available to us the Ministry should consider other options that can achieve the same outcomes. This requires an understanding of the over-lapping and conflicting needs of users, recognition of global technology trends and of the New Zealand market and context.

17. In doing this, the Ministry cannot simply adopt plans of other economies as this is unlikely to maximise spectrum value in our context. For example, ACMA has allocated the bands on a similar basis to the proposal, but those decisions[2] likely reflect the significant NBN satellite use in Australia[3] and anticipated investment in "hundreds" of new satellite gateways in urban and suburban areas along the east coast of Australia to serve the Asian Pacific market[4]. New Zealand does not have the same demand for satellite services - and therefore need for spectrum capacity - and our extensive fibre infrastructure gives more options for satellite gateway locations.

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[2] [This is mainly set out in the options paper. The decision paper more or less says IMT has got enough, so go away. ACMA options paper https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019]

[3] ACMA options paper https://www.acma.gov.au/consultations/2019-08/planning-options-28-ghz-band-consultation-092019. As at 2019, there were 68 FSS gateway licences operating at 21 locations in Australia, most of these belonging to NBN Co.

[4] Viasat indicated to authorities that it planned to invest hundreds of millions of dollars in gateway infrastructure to support Australia and Asia Pacific region – and this required access to high quality infrastructure in urban and suburban areas and use of the entire 28GHz band. Viasat submission to ACMA. https://www.acma.gov.au/sites/default/files/2020-02/IFC-09-2019_0.zip and parliament https://www.communications.gov.au/sites/default/files/submissions/viasat-submission-radiocommunications-legislation-amendment-bill-2020.pdf. ACMA options paper

18. We believe that an efficient New Zealand allocation of the band should recognise that:

    a. Mobile operators require large contiguous bandwidths of around 1000 MHz to support the service performance anticipated by the ITU standard IMT 2020 services, and to meet demand more efficiently at lowest cost (by fully using carriers). While services can be provided using less bandwidth, these have higher cost (because not using the full carrier) and will not support target speeds.

    b. The ITU has proposed stringent out of band emission limits on 5G base stations to mitigate concerns that 5G base stations operating without constraint may interfere with passive sensors on-board weather satellites resulting in unreliable data used for forecasting or in climate monitoring models. In practice, this likely means that IMT equipment in the lower part of the 26 GHz band will create 2A-B products that will fall in the EESS band and to mitigate these notch filters are required if IMT is used outdoors. Therefore, we are of the view that the lower 500 MHz in the 26 GHz will have limited use for IMT outdoor deployment.

       Accordingly, the proposal would leave 2750 MHz of spectrum available to IMT operators in practice and - with expected demand from existing and new spectrum seekers (vertical industries and Treaty of Waitangi claimants) – this would leave some providers with insufficient spectrum for ITU defined services.

    c. There is strong support from the United States, South Korea, Japan and Singapore economies – technology powerhouses with their sights set on 5G – for equipment that will be deployed in band n257. By limiting New Zealand IMT deployments to below 27.5 GHz, we forego the economies of scale brought about by aligning with these leading 5G economies. There is an overlap between 26.5 and 27.5 GHz but, in light of Treaty of Waitangi and other possible claims, there is uncertainty relating to how much – if any – of this overlap will be available to mobile operators.

       We believe that the proposed approach will likely delay IMT innovation and deployment into the New Zealand market. We expect vendor development roadmaps and priorities to align largely with the powerhouse 5G economies that have adopted an n257 based allocation. But it is just not the frequency band, mmWave systems will be deployed as either NSA or SA or MR-DC. So the band combinations that support these is also a consideration both for the base station and handsets. We risk forgoing the option to align with these early adopter economies.

    d. There is little evidence to suggest satellite systems will require 2 GHz of spectrum bandwidth to meet New Zealand demand. For example, satellite spectrum licences have been allocated in only a portion of the band to meet demand in larger, more density populated economies, i.e. South Korea has reserved spectrum above 28.9 GHz for ESIM.

19. We believe that this means - in the absence of proven satellite end user demand – allocating the band on the basis of:

    a. 24.25- 24.75 GHz to IMT private networks (i.e. in band n258 for private and in-building deployment).

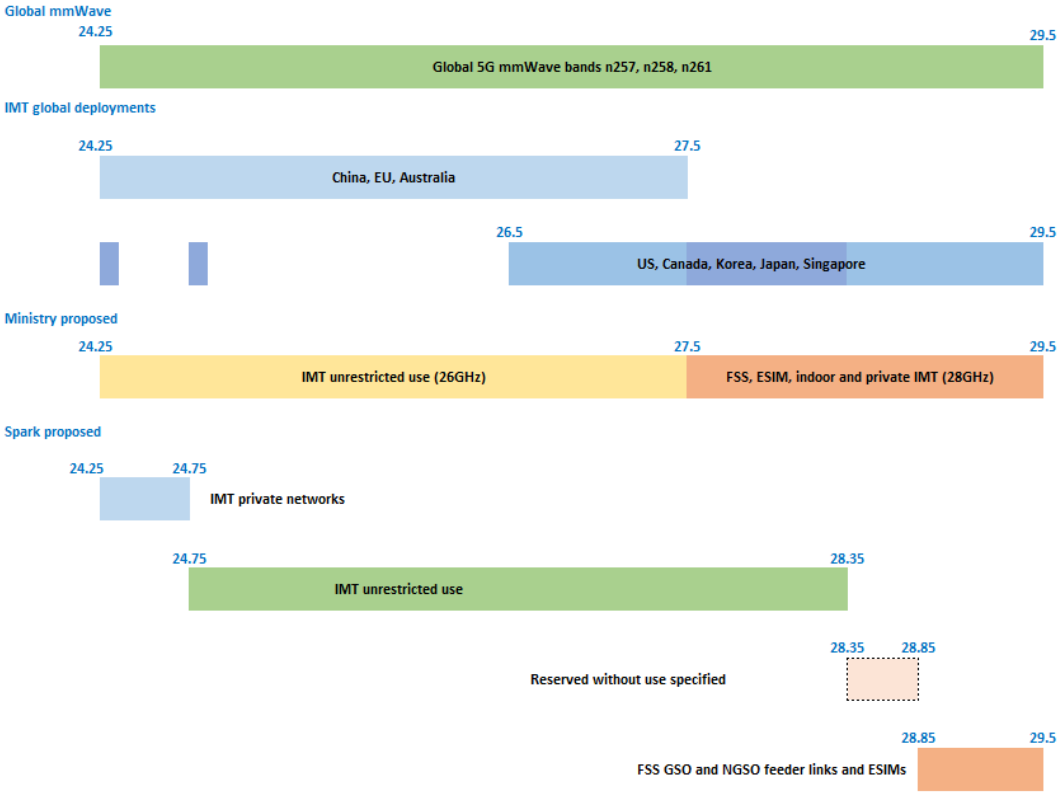
    b. All of spectrum 24.75- 28.35 GHz for IMT use (i.e. the remaining n258 and part of n257) without any deployment restrictions.

    c. 28.35 - to 29.5 GHz for FSS GSO and NGSO feeder links and ESIMs, and

d. 28.35 to 28.85 GHz reserved without use specified for possible future expansion.

20. A comparison of our proposed approach with international deployments and proposed allocation in the discussion paper is set out in Figure 5.

Figure 5: comparison of band options



21. If satellite system and ESIM operators can demonstrate New Zealand end user demand for their services, then the Ministry should consult further on

    a. An allocation that meets expected New Zealand satellite system demand, balanced against the costs imposed on IMT deployments.

    b. Specific satellite deployment conditions and licences that provide incentives to reveal true preferences and demand.

22. Infrastructure investors in any market require regulatory frameworks to be predictable and equitable – frameworks that let the Government interfere with, or steer, market outcomes lead to reduced investor confidence and poorer infrastructure outcomes. We are concerned at the differential treatment the proposal applies to mobile network operators and satellite operators, and at the limited consideration given to this by the Ministry.

23. As set out above, satellite and mobile network operators are increasingly competing with each other in digital markets. 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.

24. This proposal further illustrates this differential treatment. We expect it should prompt deeper consultation with the satellite and mobile industries to identify options for addressing unequal treatment and ensuring our country's scare spectrum is allocated to its highest possible uses.

Discussion paper questions

The technologies and applications in 24 - 30 GHz

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

25. mmWave wireless systems will be used in many applications in the network such as FWA to enable us to provide fibre like capability to users, indoor and outdoor hot spots, immersive media applications such as AR/VR, coverage in stadiums etc. The use cases will evolve further as the eco-systems mature.

26. 3GPP Rel 17 will be frozen next month, and it is based on combinations of eMBB and URLLC- this will in turn involve high data rate wireless systems offered through mmWave capability. Autonomous cars in the long run will also have mmWave beamforming in addition to CV2X in the C band and DSRC. There are many trials going on the mmWave beamforming for autonomous cars.

27. mmWave systems are not in the short term expected to be based on wide area and ubiquitous coverage. Wide area coverage is expected to be provided using low and mid-bands with mmWave deployments in geographies where there is demand or specific service requirements.

28. Operators will further need around 1000 MHz of contiguous spectrum in order to provide services that support 3GPP service performance.

Q2. What are the likely use cases for Ka band satellite services in New Zealand in the short and long term?

29. Spark is a terrestrial mobile operator. In 3GPP there are plans for non-terrestrial networks to be integrated with terrestrial networks - this is likely to be release 17 and beyond. We will likely consider augmenting our terrestrial capability with satellite but, at this stage, there is unlikely to be significant demand for satellite use in urban and semi-provincial rural areas due to existing good coverage of terrestrial and mobile networks.

30. There are significant eco-systems available especially in n257 which is also allocated to Ka band in the ITU Radio Regulations (**IRR**). We question the need to identify all of the range 27.5-29.5 GHz to fixed satellite when large jurisdictions like the US, Japan and Korea have deemed otherwise.

31. We also note that the Ministry has allocated licences to IP STAR, Inmarsat, SpaceX and SES without industry consultation. In particular, licences in greater Auckland and Awarua potentially undermine IMT services for Auckland and Southland users.

Q3. What are the spectrum requirements for ESIM (Earth Stations in motion) use in New Zealand?

32. On the face of it, the Ministry proposes to reserve a significant amount of spectrum for ESIMs. It is unclear how such large amounts of spectrum, i.e., 1- 2 GHz – can be justified for ESIM purposes. Whilst 17.7- 19.7 GHz (Station to Earth) and 28.45- 29.1 GHz (Earth to Satellite) can be used for ESIMs, it is questionable whether New Zealand needs all of the 2Ghz bandwidth available for ESIM local use:

a. New Zealand is a small country and it is unclear why we need to reserve, in effect, 2GHz of bandwidth for ESIM deployments. For example, Tbps services can be supported by bandwidths of 1Ghz, but this would suggest ESIMs plan to support data rates typically used for Holograms.

b. If there was such demand for ESIMs, then other infrastructure in the country – i.e., roads, hotels, train systems – would need substantial demand and augmentation for which there are currently no plans. For example, even if there were extra-ordinary large numbers of travellers coming to New Zealand, it would still be difficult to justify the allocation of 500 MHz of spectrum to ESIM.

33. Allocating large spectrum to ESIMs without the demand from significant infrastructure to support that demand would mean significant parts of the allocated parts of the spectrum risk being unused. The Ministry should consider the likely ESIM demand and spectrum requirements to support that demand.

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?

34. We do not think fixed services should be allocated in 27.5- 29.5 GHz. There are a number of bands that could support these services.

Proposed spectrum allocations

24.25 - 27.5 GHz

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

35. We agree that the above spectrum is one of the bands in 3GPP and is suitable for IMT we also suggest that spectrum for IMT should extend up to 28.35 GHz.

36. However, there is some regulatory uncertainty. Despite protections afforded to FSS via Res 242 and the ample margins available for FSS protection shown in the sharing studies leading up to WRC 19, there are many issues posing as hurdles for IMT deployment:

a. Ongoing discussions on Article 21.5 in the ITU create regulatory uncertainty for this band that cannot be resolved until WRC 23.

b. Ongoing discussions about Antenna models in ITU R 5D could result in a change to ITU R M 2101 that is referred to in WRC Res 242 (see encourages 2). In turn this could change the antenna patterns used in this band. If the Rec 2101 is changed then this could trigger a change to Res 242 that will not happen until WRC 23.

37. The above two issues are creating significant regulatory uncertainty and in effect may discourage IMT deployment in this band. This was also observed at a recent GSMA meeting. The regulatory uncertainty is of special concern to Spark as we are very dependent on economies of scale of larger markets.

38. The OOBE emission limits agreed at WRC 19 were set as a political compromise. The technology which we will deploy in the Spark network will be 3GPP compliant. We cannot ask vendors to provide customised equipment.

39. If the WRC 19 OOBE values are to be respected, then anecdotal indications are that an additional guard band of 500 MHz between (EESS and IMT) or larger may be needed for

outdoor use- due to 2A-B intermodulation products. We need to engage with vendors to discuss what is commercially achievable (and any constraints) once we know what spectrum we will work in. This means that 24.25- 24.75 GHz may not be useable for outdoor deployments. We note that in the UK 24.25- 26.5 Ghz is to be used for indoor use. This may avoid the guard band but restricts usage. Australia too has - in effect – used 24.25 - 25.1 GHz as a form of guard band as their identification is from 25.1 GHz upwards (leaving 24.25- 25.1 GHz as a kind of guard band).

40. We further agree that a small amount of spectrum around 24.25Ghz could be made available to private networks. This could probably serve as a guard band as well.

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

41. Spark's view is that all of bands n257 and n258 should be substantially cleared of space services (not all the band). If some spectrum must be made available to space services, then the locations of earth stations should be in places where they do not hinder the deployment of IMT.

42. We could follow the example of large jurisdictions such as Japan, Korea, and the US - see question 8.

27.5 - 29.5 GHz

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

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?

43. As noted above, the 28GHz band is currently used for both IMT and satellite systems. However, on the face of it, the consultation paper does not consider the costs and benefits of reserving the band solely for satellite systems.

44. Our primary concern is that, while there are significant implications for IMT, the proposal to reserve the whole band for satellite is not based on forecast satellite demand and spectrum calculations. The over-allocation to satellite and ESIMs would mean less spectrum overall is available for IMT and we will not be able to get technology economies of scale by aligning with major economies.

45. For example, the consultation paper proposes to make the full 28GHz band available to satellite, noting that in light of *The emerging satellite broadband market […], we propose to allocated the whole 28 Ghz band for satellite use.* However, it is unclear what the basis for this allocation is, there are no end user demand forecasts and efficiency calculations to support the proposed allocation.

46. We believe the proposed approach likely over-states any reasonable forecast of New Zealand FSS demand. For example,

    a. 6G services are aiming for a peak rate of 1 Tbps and the bandwidth needed to meet this rate is 1 GHz (significantly less than implied by the proposal). We are not aware of satellite services aiming to provide such high rates.

       If this is not the case, then the spectrum will be divided into smaller carriers as the SNR decrease for higher bandwidth carriers in satellite systems could adversely impact the link budget. Even if they are 100 MHz wide carriers there will be 20 such carriers in 2 GHz bandwidth. Even in the most-dense areas in the world 20 carriers the underlying traffic cannot justify such large number of carriers.

b. Given that ESIMs max channel bandwidth is 20 MHz we don't see any more than 100 MHz for ESIMs. Each 20 MHz channel, assuming spectrum efficiencies similar to IMT will provide 100 Mbps median capacity.

47. Further, we are not aware of any justification to reserve this amount of spectrum for ESIM bandwidth. Japan and Korea have very large populations relative to New Zealand. The Japanese and Korean 5G Allocations are shown below (Figure 6 and 7). It is worth noting that no ESIMS are allocated in Japan and perhaps in Korea only above 28.9 GHz. Spark questions the need for such large bandwidths to ESIMs in NZ without any justifications.

Figure 6: Japan

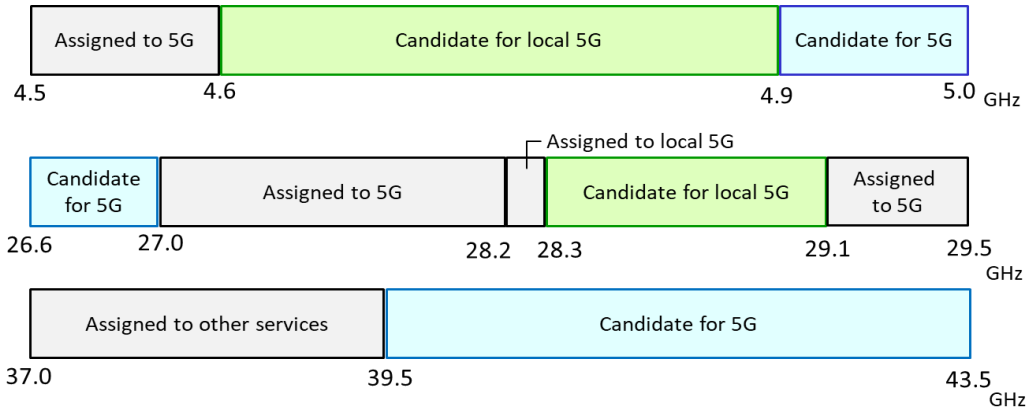
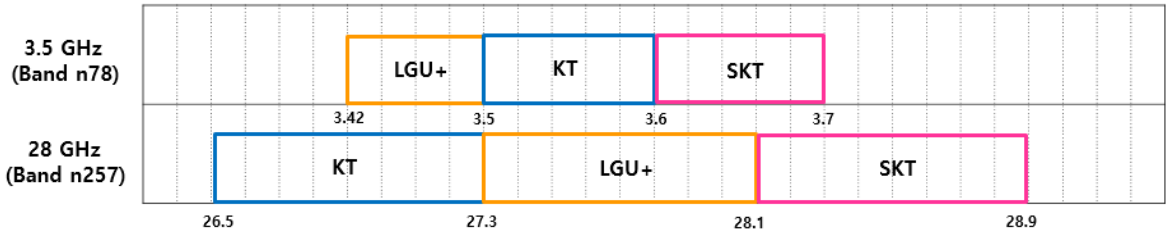


Figure 7: South Korea



48. At the same time as satellite demand is uncertain, the proposal has demonstrable implications for IMT deployment in New Zealand:

a. The proposed allocation, on the face of it, unnecessarily reduces spectrum available for IMT. As noted above, IMT operators will require large quantities of spectrum to support 3GPP defined network performance and limiting IMT deployment to sub-2.75 GHz spectrum likely means that IMT providers will have constrained services and higher costs.

b. Further, limiting access to 28 GHz band spectrum will limit the availability of innovative technologies from the New Zealand market. The n257 roadmap is significantly more advanced than the n258 roadmap.

c. We expect equipment vendor development roadmaps and priorities to align largely with the powerhouse 5G economies that have adopted an n257 based allocation. But it is just not the frequency band, mm wave systems will be deployed as either NSA or SA or MR-DC. Accordingly, the band combinations that support these is also a consideration both for the base station and handsets. We would forgo the option to align with these early adopter economies.

49. Any allocation that relies on reserving a pre-set allocation to ESIMs and satellite irrespective of expected has an inherent bias and is unlikely to result in the best outcomes for New Zealanders.

50. In order to best manage uncertain satellite demand, we recommend that the Ministry:

    a. Make available a limited amount of HDFSS in this band for satellite use, but this should be limited to areas where there is no impact to outdoor IMT and – without a full assessment of all costs and benefits - not for large gateways for countries other than NZ. We cannot be a place for establishing gateways for all of the Asia Pacific at the expense of local 5G deployment.

    b. Permit ESIMs use in international waters and international airspace. Landing aircrafts should switch off ESIM transmitters. Ships in shore should do likewise. In both cases terrestrial IMT can be used for broadband coverage. Even so ESIM bandwidth is based on 20Mhz channels (ETSI TR 103 399). A large amount of such channels will fit in 1Ghz bandwidth (Fig 11) and 2 GHz bandwidths.

51. In which case as set out above, the Ministry should consider allocating the band - in the absence of proven satellite end user demand that requires additional spectrum – to:

    a. 24.25- 24.75 GHz to IMT private networks (i.e. in band n258 for private and in-building deployment).

    b. All of spectrum 24.75- 28.35 GHz for IMT use (i.e. the remaining n258 and part of n257) without any deployment restrictions.

    c. 28.35 - to 29.5 GHz for FSS GSO and NGSO feeder links and ESIMs, with 28.35 to 28.85 GHz reserved for possible future expansion.

52. If satellite system and ESIM operators can demonstrate New Zealand end user demand for their services, then the Ministry should consult further on

    a. An allocation that meets expected New Zealand satellite system demand, balanced against the costs imposed on IMT deployments.

    b. Specific satellite deployment conditions and licences that provide incentives to reveal true preferences and demand.

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

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?

Q12. Are there any other issues of sharing use between satellite earth stations and ESIMs that you would like to bring to our attention

53. Spark has commented on options 1 and 2 and neither are suitable for unrestrained IMT. We note that we will deploy IMT either indoor or outdoor in a MR that will be allocated to us.

54. Sharing between IMT and FSS is problematic as per recent discussions in ITU working party 5D and, until that working party concludes, it is not possible to comment further.

55. Sharing between IMT and ESIMs is easier via exclusion zones and limits on ESIMs transmitters within NZ airspace and marine boundaries.

29.5 - 30 GHz

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

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?

Q12. Are there any other issues of sharing use between satellite earth stations and ESIMs that you would like to bring to our attention

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

56. Spark has no comment.

Licensing Options

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

57. National management rights.

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

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 licence?

Q17. Do you agree RSM should adopt 3GPP NR FR2 based channel bandwidth to design a channel plan in the radio licence regime for IMT services?

58. We do not support a GURL approach as this would mean there is no mechanism for interference resolution. Even if the Ministry allocates some spectrum to private networks, it should be through the existing licencing process as that any interference downstream can be resolved.

59. Further, private networks must be time and frame synchronised with licenced deployments.

60. All operators should deploy 3GPP compliant equipment. Further, the choice of a sub carrier and channel bandwidth is up to the rights holder. These should not be set by MBIE.

Technical considerations

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

61. Yes, we agree that out of band emission limits and spurious domain limits should be based on 3GPP standards. We agree that these limits are based on TRP as the base stations are of type 2-O X.

62. IMT networks are TDD, so any co-existence amongst private and non-private networks must be based on synchronisation and agreed frame structures.

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?

63. The durations of MR should be a balance between investment certainty and technology Spark will be willing to consider a process to agree amending technical requirements partway through the MR duration.

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

Q21. Which option do you prefer to set the unwanted emissions?

Q22. If we use a TRP option for setting AFEL and UEL, do you have any recommended solutions on TRP measurement in field?

Q23. Do you agree that RSM should set unwanted emissions limits (in UELs and AFELs) base on 3GPP category B requirements? If no, please explain the reasons and provide your suggestions?

64. All operators should comply with 3GPP standards. Further, Spark prefers the AFELs be set in terms of TRP and a method to convert TRP to EIRL be specified in the MRs just as it was done for the C band.

65. See answer to 21 above.

Sharing and compatibility

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.

Q25. Do you have any insights on equipment availability at, or close to, the edge of 24.25 GHz that can meet both pre-1 September 2027 and post-1 September 2027 unwanted emission limits? Is there any additional technical solution such as frequency separation or filtering required for some equipment types?

66. It is possibly too early to make a call on this. We should first set the band limits then discuss this.

67. Spark remains concerned with the WRC 19 OOBE limits. The limits were agreed at WRC using assumed simulation conditions, i.e., WRC 19 used 8,8 co polarised antennas and a Paris based model to determine OOBE limits. However, mmWave deployments will use at least 256 antenna elements if not more (even the C band uses 32T 32 R) and due to larger antenna elements and arrays of sub arrays the interference to EESS systems will not be as modelled in TG 6/1.

68. The MBIE should be concerned with co-existence and not specify equipment parameters. The equipment will comply with 3GPP specifications.

69. The emission limits should reflect the specified in 3GPP 38 101 and 38 104 and not put onerous conditions on deployment as mmWave link budgets are extremely tight.

70. The transition dates set by WRC were a political decision. We will deploy equipment compliant to 3GPP specifications which have not changed in response to WRC 19.

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

71. 3GPP sharing guidelines for RAS anecdotally point to a 25KM separation between IMT and RAS sites. In any case, RAS should be in radio quiet zones such as Mount John observatory and not populated regions.

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

72. We have commented on this above.

Synchronisation

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

Q29. If the network is unsynchronised, what is the best way to manage the interference between unsynchronised operators?

Q30. If your preference is a semi-synchronised network, what is your suggestion on setting the synchronized parameter?

73. Networks across the entire 24 – 30 GHz range must be fully synchronised in time and frame structures.

Q31. Do you agree that think 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?

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?

74. Comments above

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

75. Spark would not like restrictions on IMT use cases such as FWA. We will deploy services based on market needs which will include eMBB, eMTC, uRLLC, and combinations of all three.

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

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

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?

76. Spark has no comment.

[End]