Global mobile Suppliers Association

Response to Radio Spectrum Management's 24 – 30 GHz use in New Zealand discussion document

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24 - 30 GHz use in New Zealand

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GSA[1] Response to Radio Spectrum Management's 24 – 30 GHz use in New Zealand discussion document

In this response to the *24 – 30 GHz use in New Zealand discussion document* (herein referred to as "the discussion document") the GSA focusses on maximizing the utility of the subject spectrum (and hence provide the greatest economic and social value to New Zealand), whilst also affording sufficient protection to the operation of other Radiocommunications services. If RSM requires any clarification to this response, please do not hesitate to contact:

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1. Introduction

The GSA is pleased that RSM is planning the 24 – 30 GHz band in order to provide additional spectrum for the delivery of 5G NR based Wireless Broadband Services (WBB). RSM's licensing of low band (< 3 GHz), mid band (< 7 GHz) and high band spectrum (> 24.25 GHz) will allow the deployment and development of 5G services in New Zealand covering a wide variety of use cases, with differing business models across different rural, suburban and metropolitan environments.

[1] *The GSA (Global mobile Suppliers Association, https://gsacom.com) develops strategies and plans, and contributes studies and technical analysis to international, regional and individual country policymakers and regulators to facilitate the timely availability of spectrum for use by mobile network operators. GSA has a focus group for spectrum topics for technical and regulatory matters of radio spectrum pertaining to the successful evolution of International Mobile Telecommunication (IMT) and associated radiocommunication systems and comprises a team made up of spectrum and regulatory affairs specialists from GSA Executive Member and GSA Member companies. In addition, GSA reports regularly on global spectrum developments.*

The remainder of this document provides answers, where applicable, to questions posed in the discussion document. Questions (and answers) for which the GSA does not provide a response are not included in this document.

2. The Technologies and Applications in 24 – 30 GHz

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

In the last few months, the wireless ecosystem has increased the amount of mmWave bandwidth providing downlink and uplink data transfers, literally doubling the channel bandwidth in both directions by introducing larger downlink and uplink carrier aggregation schemes. Specifically, network infrastructure, chipsets, and mobile devices in North America now support eight 100 MHz channels (8x100 MHz or 8CC) in the downlink direction and two 100 MHz channels (2x100 MHz or 2CC) in the uplink direction. Previously, the limitation was 4CC in the downlink direction (cell site to mobile device) and 1CC in the uplink (mobile device to cell site).

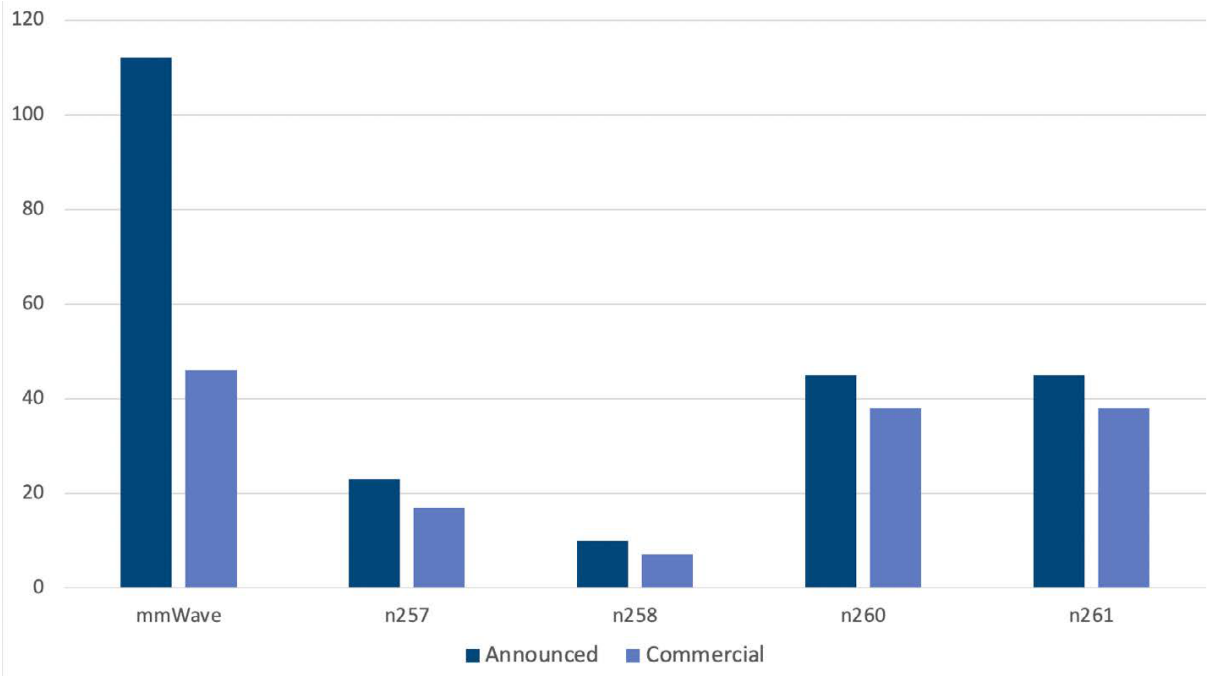
5G NR in mmWave spectrum was envisaged to deliver extreme mobile broadband (eMBB) use cases, and this is still the case, however there are new 5G NR mmWave use cases, thanks to technology advancements as well as to the overall market maturity. In addition to eMBB Operators have been interested in using 5G NR mmWave to offer fixed wireless access (FWA) services, and with the recent introduction of high-power CPEs (consumer premise equipment) and slight modifications to the configuration of the mmWave radio channel, the prospect of mmWave FWA is compelling. In addition to extending the effective range of the mmWave signal to several kilometers versus a few blocks, the high-power CPE enables mmWave signals to provide meaningful data speeds with near- and even non-line-of-sight (NLOS) radio conditions.[2]

5G NR mmWave services are no longer limited to outdoor deployment scenarios. When deployed indoors, mmWave cell sites provide surprisingly good coverage for enterprise use cases. In effect, the mmWave signals extend well beyond LOS conditions, providing coverage in front and behind the 5G NR mmWave radio, as well as around hallway corners and into individual office spaces, thanks to the reflective nature of the mmWave signals.

GSA's GAMBoD database includes 112 announced 5G devices that do or will support mmWave spectrum bands. Seventy of those are understood to be commercially available. The table below indicates how these devices are spread across mmWave bands:

[2] ALL THINGS 5G NR mmWave - AN UPDATE ON 5G NR MILLIMETER WAVE (mmWAVE) NETWORK PERFORMANCE AND NEW USE CASES, Signals Research Group, January 2021

Figure 1: Known support for 5G spectrum bands above 24 GHz in announced 5G devices



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?

Maximum utility (and hence the highest value use) of the 26 GHz band is achieved via unencumbered spectrum for 5G NR. Hence, existing fixed links should be migrated to alternative bands, for example the 23 GHz and/or 38 GHz fixed service bands.

3. Spectrum Allocations

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

The GSA agrees that New Zealand should allocate 24.25 – 27.5 GHz band for IMT (5G NR) services. And it is recommended that the allocation accommodate approximately 1000 MHz per operator to ensure that the full range of use cases and capabilities are realised.

Around the world momentum is building to allocate mmWave spectrum for 5G services[3]:

- One hundred and eighty operators in forty-five countries/ territories are investing in mmWave (in the form of tests/trials, acquisition of licences, planning deployments or engaging in deployments);

[3] mmWave Bands: Global Licensing and usage for 5G – Executive Summary, GSA, May 2021

- One hundred and thirty-two operators in 22 countries/territories have been assigned mmWave spectrum (often on a regional basis) enabling operation of 5G networks;
- Twenty-eight operators in 16 countries/territories are known to be already deploying 5G networks using mmWave spectrum;
- Nineteen countries/territories have announced formal (date-specified) plans for assigning frequencies above 24 GHz between now and end-2022;
- One hundred and twelve announced 5G devices explicitly support one or more of the 5G spectrum bands above 24 GHz. Seventy of those devices are understood to be commercially available.

Around the world mmWave spectrum bands are being opened up explicitly to enable provision of 5G services. The 24.25–29.5 GHz range covering the overlapping Bands n257 (26.5–29.5 GHz), n258 (24.25–27.5 GHz) and n261 (27.5–28.35 GHz) has been the most-licensed/deployed 5G mmWave spectrum range
to date.

- One hundred and sixty-one operators in 44 countries/territories are investing in 5G (in the form of trials, licences, deployments or operational networks) across the 24.25–29.5 GHz spectrum range.
- Of those, 112 operators are known to have been licensed to deploy 5G in this range.
- Twenty-seven operators are understood to be actively deploying 3GPP-compliant 5G networks using this spectrum.

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

The 26 GHz band (24.25–27.5 GHz) should be allocated exclusively for 5G.

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?

The GSA view is that RSM must make for the ability to accommodate primary FWA, private IMT networks and eMBB in a portion of the 28 GHz band should be made. When making for such an ability the proposal should be aligned with the premise that approximately 1000 MHz is recommended per 5G licenses/operator to ensure that the full range of use cases and capabilities are realised.

4. Licensing Options

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

The GSA notes that 5G deployments cover a range of use-cases, licensees and geographic requirements. For example: mobile network operators will require access to mmWave spectrum in urban, suburban and in some rural locations, whereas wireless Internet service providers (WISPS) may require access to the spectrum across a particular region for FWA, and private/localised networks may be required for enterprise operations, and/or to support industrial operations in either a single location and spread across multiple locations. To meet this variety of usage and deployment needs a range of spectrum management and licensing options is required – in a short a combination of nationwide management rights, regional rights and radio licenses are required across the 26 and 28 GHz band.

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

Under agenda item 1.13 WRC-19 considered the band 24.25 – 27.5 GHz and globally identified it for IMT. The WRC also reached a compromise decision to protect, using out of band emission limits (OOBE), and adjacent band services including the EESS (passive) in the 24 GHz range. The protection of these services is predicated on regulators having knowledge and control over IMT deployments in the band above 24.25 GHz. This knowledge and control are usually achieved by recording deployments and associated parameters, licensing the services and if necessary, compliance and enforcement activities. It is difficult to see how this can be achieved using General user radio license approach, which although may contain conditions and restrictions on the deployment under which use is authorized, does not lend itself to the recording of actual deployments and parameters necessary for interference minimization. Furthermore, if interference into the EESS (passive) is noticed, it is likely to be caused by the aggregate out of band power from multiple devices, which further exacerbates tracing the origin(s) of the interference and how and where to take compliance and enforcement action. Taking the latter point to its conclusion once a band has been authorized via a General User Radio license and deployments have occurred it is very difficult to undo.

It is noted that no Administration, other than Australia, has implemented/contemplated general user licensing or license exemption in the 26 GHz and 28 GHz spectrum.

Furthermore, whilst 3GPP has completed specifications for 5G NR-U in mid-band spectrum, work is not being undertaken for 5G NR-U in 26 GHz or 28 GHz high-band spectrum.

For the reasons outlined above GSA cautions the implementation of GURL at the 26 GHz band. It would be prudent to delay consideration of a GURL until more information is available on the large-scale deployment of spectrum and licensed mmWave 5G services in New Zealand.

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?

If RSM deems it necessary for spectrum to be set aside for ESIM then this should not be to the detriment of deploying IMT/5G services and the technical conditions for ESIM should align with Res. 165 (WRC-19).

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?

3GPP technical specifications such as 38.101 and 38.104 are important to implement 5G. Therefore, GSA recommends that RSM adopt 3GPP NR FR2 based channel bandwidth for 5G, taking into account global harmonization and interoperability. The GSA also recommends that RSM to adopt a channel plan, including accommodation for in-band carrier aggregation options allowing approximately 1000 MHz per deployment/operator.

5. Technical Considerations

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

Many countries set up their own regulatory requirements based on 3GPP technical specifications (TSs) such as 38.101 and 38.104. These technical specifications are significant to implement 5G.

Therefore, GSA is of the view that RSM should refer 3GPP technical specifications to set the regulatory requirements for spectrum allocated to IMT.

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?

The GSA is in the process of determining a clear position as this critical issue and its solutions e.g. TRP measurements in the field are under currently study in 3GPP and ITU-R. The GSA recommends that RSM monitor developments in this area, and GSA will be pleased to provide further input as it becomes available.

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?

The GSA is of the view the unwanted emission limits should refer to the limits in 3GPP Release 15 specifications. Category B emission limits defined in 3GPP technical specification 38.104 should be the basis for this matter.

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.

In principle, GSA welcomes the outcome of the WRC-19, as a global compromise, concerning IMT-2020/5G unwanted emission limits from the 26 GHz band to protect EESS(p) in 23.6 – 24.0 GHz.

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?

It is the opinion of GSA that the WRC-19 agreement for the unwanted emission limits for the 26 GHz band should be followed.

Related to equipment, GSA is of the view that the limit of -33 dBW/200 MHz can be reached by base stations manufactured from now, while – taking into account foreseen future technology improvements – products manufactured after 1st Sept 2027 are expected to be able to implement with the more restrictive value of -39 dBW/200 MHz. GSA also points out that the values defined at WRC-19 already represent a compromise, as the value stated by 3GPP for spurious emissions, -13 dBm/MHz corresponds to -20 dBW/200 MHz.

GSA does not support values which would be more stringent than those decided at WRC-19. GSA also does not support to start the phase 2 before 1st September 2027.

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?

GSA is of view that the resolves 2.1 of Resolution 242 (WRC-19) is part of the “agreement package” from WRC-19 for the implementation of IMT networks to protect satellite systems and is a national

matter on how to solve for each specific country. However, regulatory measures should not place further conditions on the implementation of IMT than those specified in Resolution 242 (WRC-19).

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?

The determination of coordination/exclusion zones for existing FSS earth stations should be undertaken in accordance with international best practice/ITU-R Recommendations etc.

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

GSA agrees that FSS earth stations may be more prevalent in less populated areas while IMT may be more prevalent in more densely populated urban and suburban areas, as described in the consultation document.

Relative to RSMs proposal, the GSA offers the following modifications (shown in **bold** text) below:

- Require that all FSS earth stations and FWA Base Stations be licensed for specific locations.
- Require the FWA service areas recorded in the licence.
- Establish certain geographic areas where **existing** FSS has priority over FWA. RSM will define certain geographic areas in sparsely populated rural areas where **existing** FSS earth stations may be licensed and have a primary status. Within these geographic areas the following will apply:
    - Each FSS earth station will have a coordination zone calculated on a case by case basis. IMT FWA operating within this co-ordination zone must tolerate the interference.
    - IMT FWA will have a secondary status meaning that if a new FSS earth station is established, existing IMT FWA in the co-ordination zone will have to tolerate the interference. **Existing IMT FWA should have priority over new FSS earth stations**

- RSM will define certain geographic areas in more densely populated urban and suburban areas where IMT FWA may be licenced and will have a primary status.
    - Approved Radio Engineers will calculate a co-ordination zone for each FWA licence. FSS Earth Station may operating within this co-ordination zone provided there is mutual, documented agreement with the licensee.
    - FSS earth stations will have a secondary status in those defined areas meaning that if a new FWA is established, existing FSS earth stations within the co-ordination zone should not cause interference to the FWA service.

- Set an EIRP limit towards the horizontal plane for FSS earth station transmitters. **Where the pfd limit is derived solely based on IMT RX characteristics**.

In relation to the EIRP limit mentioned above, the FCC regulation (FCC-16-89, Paragraph 54) specifies a pfd limit for protection of UMFUS receivers in 28 GHz, the GSA would suggest RSM to consider a similar approach to facilitate the sharing between FSS and IMT FWA in the 28GHz band).

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

The GSA prefers that RSM specify a pfd limit which is derived solely based on IMT RX characteristics.

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?

The GSA is of the view that ESIM operations must protect 5G stations operating in 28 GHz. Protections of 5G services should be guided by national regulation within territory of an administration (no co-channel operation) and guided by Resolution 169 (WRC-19) for cross-border situations.

In particular for Aeronautical ESIM, we have the further observation on how to ensure the requirements of pfd mask defined in Resolution 169 (WRC-19) are practically met due to requirement in receiver domain of a victim. Unlike a satellite and a fixed earth station which have had a regulatory measure type of pfd limits, Aeronautical ESIM mounted in aircraft would dynamically move everywhere, so that it is not easy to meet the pdf limit anywhere and anytime dynamically. Furthermore, there is no specific technical standard for ESIM taking into account this matter.

In this regard, the GSA is of the view that a compatible requirement with WRC-19 decision practically to ensure the protection of 5G from A-ESIM should be further studied.

6. Conclusion

The GSA thanks the RSM for its open, consultative approach towards allocation of mmWave spectrum for 5G NR. In this paper the GSA provides information to show that there is demand for this spectrum to meet the varied use-cases, environments and business models that 5G enables and to enjoy the economic benefits that 5G mmWave deployments will accrue RSM should move as quickly as possible to releasing/allocating the 26 GHz and 28 GHz spectrum for 5G NR.

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