Allocation of 24 – 30 GHz Spectrum in New Zealand

RSM Technical Discussion Document

2degrees Technical Submission, 28 November 2025

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1. Introduction

Two Degrees Networks Limited (2degrees) welcomes the opportunity to comment on the Ministry of Business, Innovation and Employment (MBIE) Technical discussion document, *Allocation of 24 – 30 GHz Spectrum* (the Discussion Document).

MmWave spectrum is a key band for future wireless services, allowing mobile networks to provide a full 5G experience through high capacity, ultra-fast data speeds and low latency. MmWave will provide high-capacity connectivity, allowing for more simultaneous users and devices without network congestion.

We currently see rural Fixed Wireless Access (FWA) and event/capacity hotspots being the two primary use cases driving demand for mmWave spectrum. However new use cases may emerge in future.

Recent FWA ecosystem developments for both BS and UE have demonstrated the ability to deliver Gigabit speeds beyond 7km with Line of Site.

While event and capacity hotspots are primarily located within urban centres, there are also a considerable number of large events outside urban boundaries where temporary capacity solutions are required that would benefit from mmWave spectrum.

Based on these primary use-cases, 2degrees prefers Private/National Management Rights as the most appropriate spectrum management regime to support nationwide deployment of mmWave services within the 26 GHz (Primarily Mobile) band.

2. Responses to specific questions

1. Do you agree with RSM's proposed new spectrum uses outlined in Section 1.1? If not, provide details on the modifications you wish to propose with appropriate reasoning.

We agree with RSM's proposed new spectrum uses outlined in Sector 1.1. Methodologies for allocation within the shared/Lower 28GHz band.

2. Do you agree with RSM's assessment of the impact on existing users within 23.6 – 24 GHz, 24 – 24.25 GHz and 24.25 – 27.5 GHz, including the proposed technical and operational considerations, as well as technical conditions for the protection of EESS (passive) and potential RAS use in 23.6 – 24 GHz from future Mobile Service emissions in the adjacent 24.25 – 27.5 GHz band? If not, please provide further specific technical details and rationale, including technical studies.

We agree with RSM's assessment.

3. Are you aware of other locations apart from those listed in Table 3 which would be likely be used for RAS within New Zealand? If so, please provide details of these locations including the technical and operational parameters of the RAS receiver along with supporting material showing firm plans to establish a site at these locations.

We are not aware of any other locations apart from those listed in Table 3.

5. Do you agree with RSM's understanding of the spectrum requirements and key usage scenarios for enabling different services and applications (e.g., Mobile Service, EESS and SRS) in 24.25 – 27.5 GHz?

Industry and global trends align with the mobile service use cases highlighted in the introduction; however, it is important to highlight that use cases are still developing, and we foresee new use cases arising before the 2028-2030 Mobile allocation window.

6. What are your spectrum estimates for the use of Mobile Services, EESS and SRS in 24.25 – 27.5 GHz which you wish to implement or use? Present a technical analysis with appropriate justification.

Global allocations vary between 200MHz and 1200MHz, with the median allocation of band n258 being 400MHz. We expect mobile services to require between 400MHz to 800MHz of spectrum as use-cases and demand continue to grow before allocation in New Zealand. Allocations of 400-800MHz are required for two reasons; firstly, to provide sufficient end-user data throughput for a system that is challenging from the radio propagation perspective. And secondly, to provide sufficient network capacity to make the required capital investment feasible.

7. Can you provide a link budget of a system which you plan to operate in 24.25 – 27.5 GHz, which will assist RSM to better plan, allocate and assign this frequency range?

At this time we think a generic link budget doesn't provide useful input as use-cases and hardware ecosystems continue to develop. Hardware ecosystems, bandwidth allocated and deployment strategies will also drive unique link budgets.

8. Do you plan on operating mobile systems that are not standardised by 3GPP? If so, what type of equipment do you plan to operate and what are its technical characteristics? Where possible, please provide the relevant supporting technical documentation.

No.

9. Does the mobile BS and UE you wish to operate within 24.25 – 27.5 GHz have unwanted emissions falling within 23.6 – 24 GHz of –39 dBW/200 MHz for BSs and –35 dBW/200 MHz for UEs? If so, could you provide details of the unwanted emission mask as a function of frequency? If not, could you provide the unwanted emissions limits of the equipment you wish to operate with the necessary technical justification?

Yes, BS hardware currently available meets the -39 dBW/200MHz within 23.6-24GHz. We do not currently have detailed emissions mask/limits information available.

10. Does the mobile BS you wish to operate meet the –60 dBW/MHz Category B spurious emissions limit from Recommendation ITU-R SM.329? If not, what do you propose for the necessary protect EESS (passive) receivers in 50.2 – 50.4 GHz and 52.6 – 54.25 GHz from the second harmonic of mobile BS emissions within 24.25 – 27.5 GHz?

Yes, BS hardware currently available meets spurious emissions limits as recommended by ITU-R SM.329.

11. Do you agree with our 5% quantification for the use of the terms "very limited" number of BSs operating in 24.25 – 27.5 GHz that are expected to communicate with a positive elevation angle towards indoor mobile UEs? If not, what technical modifications would you suggest to this quantification?

Positive elevation angles towards indoor mobile UEs could exceed 5% due to New Zealand's varied topography and challenging terrain which often drives unique solutions to provide coverage to our customers. We see FWA use-cases as the key contributor to this with current indoor and outdoor CPE's incorporating high gain antennas and beamforming to increase the energy density of the signal reaching the receiver.

Street level BSs may therefore supply FWA services to high rise buildings/apartments or nearby hills.

For non-FWA mobile use-cases, outdoor-to-indoor propagation is virtually non-existent, users will typically be distributed on ground level so will typically receive a "downwards-pointed" beam from the (higher mounted) base station.

12. For mobile system deployments envisaged in 24.25 – 27.5 GHz, what are the typical range of values for electrical and mechanical tilts which you intend to use? Do these parameters relate to the deployment environment (i.e., urban, sub-urban, etc)? If so, provide details of the relationship.

Electrical and mechanical tilting is not typically used with mmWave radios as they employ higher-order beamforming technology. Beamforming uses a phased array antenna system to focus the signal toward a specific receiver or target, therefore traffic/user location can dictate the beam steering direction.

Actual beam range can be configured in software and in some cases can be shifted vertically according to a digital tilt parameter.

Urban areas would typically see higher elevation ranges of beamforming (as CPE can be significantly higher or lower than the horizon), i.e. +/-30°, in rural areas the variation would arise from terrain variations which would typically not driver significant variance in beamforming elevations, typically less than +/-5°.

13. How would you mathematically characterise the term "normally" pointing the BS below the horizon, as quoted in "resolves 2.1" of Resolution 242 (WRC-19)?

Please refer to question 11 & 12.

14. What would be your mobile BS's typical elevation beam steering range and would the composition of the BS antenna array cause grating lobes to occur? If so, would you be able to quantify the direction and magnitude of these grating lobes?

Typically -30° to +30°, however these can be configured/optimised based on user distribution.

15. What type of TDD synchronisation options would you prefer and why? Do you prefer to have a default frame structure? What do you consider the underlaying technical conditions to manage the any potential interference should be?

While use cases are still developing, global deployments show alignment with C-Band frame structures e.g. DDDSU. Interference management in TDD systems is critical and therefore a default frame structure should be considered. 2degrees supports a default frame structure approach, preference should be given to the following considerations:

- Globally adopted frame structures to ensure hardware and feature availability
- Alignment with common use-cases i.e. uplink/downlink demand
- Intermediate reviews of suitability of frame structure between parties

16. Do you agree with RSM's assessment on the need to design exclusion areas around the proposed EESS and SRS (space-to-Earth) sites in 25.5 – 27.0 GHz to protect them from aggregate Mobile Service emissions in 24.25 – 27.5 GHz? If not, what other technical alternative(s) would you suggest?

We are keen to ensure that the benefits of mmWave spectrum allocations are not undermined by inadequate interference management. We acknowledge the importance of interference mitigation with co-existing services, however careful consideration and consultation with MNOs is required when designing exclusion zones so to not unnecessarily limit one of the primary mmWave Mobile Service use-cases (e.g. Rural FWA). As a national wireless network operator, limiting exclusion zones and appropriate coordination between MNOs and Satellite users is critical to provide a competitive mmWave based FWA services nationwide.

We support no further long term licensing in the 26 GHz band until the assignment process has occurred. With use cases and hardware ecosystems still developing, it may be beneficial to trial mmWave systems in the shorter term. Allocation of bands outside existing and forecast mobile allocations should continue to be allocated to other services.

17. Do you agree with RSM's assessment of the licencing framework for EESS (space-to-Earth) and SRS (space-to-Earth) anticipated to operate in 25.5 – 27 GHz? If yes, provide your reasoning. If no, which other alternative would you suggest to licence these services and why?

As rural FWA is one of the primary use-cases within the 26GHz band, we are concerned that if many exclusion areas are defined for EESS and SRS may reduce the feasibility to deploy a viable rural FWA product. We support no further licensing until the assignment process is undertaken.

22. Do you agree with RSM's understanding of the spectrum requirements for enabling different services and applications, e.g., FSS (Earth-to-space) and Mobile Service in 27.5 – 28.35 GHz?

We agree with RSM's understanding of spectrum requirements are aligned with 26GHz.

23. What are your spectrum estimates for FSS (Earth-to-space) and Mobile Services (including their applications) which you wish to implement or use in the 27.5 – 28.35 GHz range?

Please refer to question 6.

24. Can you provide a link budget of systems which you plan to operate in 27.5 – 28.35 GHz, which will assist RSM to better plan, allocate and assign this frequency range?

Please refer to question 7.

25. Do you agree with the geography-based by area type option of sharing the 27.5 – 28.35 GHz frequency range between FSS (Earth-to-space) and Mobile Services, as detailed in Option 1? If not, please propose alternatives with the required details for RSM's consideration.

Yes, we agree with the geography-based by area type approach and prefer Option 1 to be utilised when sharing the 28 GHz Lower band (27.5 – 28.35 GHz). This will make simplify deployment planning and minimises coordination efforts, however ensuring fair allocation and usage of shared spectrum within urban areas will need to be considered.

26. Do you agree to divide Option 1 by Part A and Part B by using the Statistics New Zealand defined area accessibility criteria? If not, please suggest an alternative criterion which RSM could use?

Yes, we agree with this definition.