

24 - 30 GHz use in New Zealand

RSM Discussion Document

2degrees Submission, 10 June 2021





Contents

1	Introduction.....	1
2	Overall Comments.....	1
3	Responses to specific MBIE questions	2

Confidential and market sensitive information

Confidential and market sensitive information that Two Degrees Mobile Limited (**2degrees**) has included in this submission, based on the view that it can be withheld under the Official Information Act 1982, is marked in bold square brackets [**C-I-C**]. We ask that we be consulted on any request received for the release of such information.



1 Introduction

Two Degrees Mobile Limited (**2degrees**) welcomes the opportunity to comment on the Ministry of Business, Innovation and Employment (**MBIE**) Discussion Document, *24 - 30 GHz use in New Zealand (the Discussion Document)*.

2 Overall Comments

It's important 2degrees can acquire 1 GHz of mmWave spectrum

The mmWave spectrum is a key band for future wireless services. We are pleased that, following WRC-19 decisions, MBIE is now considering the allocation of this band.

Our primary concern is that - as a national wireless network operator seeking to provide competitive services to our customers nationwide - we will be able to acquire at least 1 GHz of mmWave spectrum. MmWave technology offers very high speeds, significant capacity, and low latency. It enables much enhanced customer experiences – including VR/AR video experiences and massive simultaneous usage (for example at major events, transport hubs, for multi-dwellings services and private business networks). It will be essential to providing quality customer services to both consumers and businesses, and critical to competition, given the strong growth in wireless broadband demand, which is forecast to continue.

As you will be aware, 2degrees now serves more than 1.6 million fixed and mobile subscribers, and launched a competitive fixed wireless service earlier this year. We are well underway with our 5G rollout, and are building out our 5G network with our new 5G partner Ericsson, with plans for 700 5G sites already. We aim to bring New Zealanders a world-class 5G network, the best in New Zealand. Services on mmWave spectrum will be a key part of this.

Don't let interference issues undermine benefits

We are keen to ensure that the benefits of mmWave spectrum allocation are not undermined by inadequate interference management. There are higher risks of interference with TDD systems. We caution against allowing GURL in IMT bands, because interference issues arising from these licences are likely to be very difficult to address and costly: GURL works on the assumption that complying with emission limits will not cause interference. However, there is no mechanism to address interference in the event the limits are not set appropriately (for example because they are set too high, or because a larger number of devices than initially anticipated use the band).

We support synchronisation of IMT services, with any interference mitigation mechanisms (such as guard band or filtering) required to be put in place by those that choose not to fully synchronise. As well as some increased flexibility, there are very significant costs and inefficiencies to semi-synchronisation and non-synchronisation of IMT networks. In our view, MBIE should quantify the impact of interference from non-synchronisation in this band before deciding on the level of synchronisation required. This needs to take into account, for example, ECC study indications that semi-synchronised or non-synchronised services will not be able to co-exist in adjacent bands. Table 6 in the Discussion Document shows that when there is conflict between the TDD slots, systems operating in adjacent channels will interfere with each and cannot coexist.

2degrees supports the adoption of Total Radiated Power (TRP) to set unwanted emissions, in line with what is being adopted internationally, rather than the current EIRP. These are more appropriate with adoptive antenna systems (AAS) systems. However, we note that while



incorporating the TRP concept into the Radiocommunications Act, we support RSM making other changes to address shortcomings regarding interference management.

Spectrum access shouldn't favour less efficient competitors

MBIE has proposed allocation of mmWave spectrum to a number of different services such as satellite and IMT in the Discussion Document. Many of these services compete - or may compete - against each other, for example in the provision of 5G broadband services.

MBIE is also considering multiple allocation mechanisms - which could have vastly different costs allocated to the different-technology spectrum users (for example, management rights versus radio licences versus GURL). It will be important to ensure that MBIE doesn't artificially support some players providing competitive commercial services over others. We support MBIE adopting a consistent approach to spectrum pricing for competing services. This is especially important given the context of large-scale network investments required and shorter technology cycles.

3 Responses to specific MBIE questions

The technologies and applications in 24 – 30 GHz

Question 1: What are the most likely use cases in New Zealand for mmWave based 5G services?

The large blocks of spectrum available at mmWave frequencies, and high order MIMO systems, will enable ultra-fast applications and provide significant additional capacity for Enhanced Mobile Broadband (eMBB), including competitive fixed wireless access (FWA) consumer services, compared to other 5G bands. This will be critical given the strong growth in wireless data demand, which is set to continue.

The very large bandwidth available will enable use cases not possible today, and provide for ultra-reliable and low latency communication (uRLLC) and massive machine type communication (MMTC) in localised areas.

Given its high frequency characteristic, propagation losses mean mmWave spectrum is unlikely to be used for wide area coverage.

Question 2: What are the likely use cases for Ka band satellite services in New Zealand in the short and long term?

High throughput satellites use the Ka band to deliver broadband services. Some of these satellite services are capable of delivering broadband speeds comparable to some current terrestrial networks (for example, Starlink and Kacific satellite services).

While we consider the provision of broadband by satellite is, and will continue to be, important in supplementing terrestrial broadband in rural areas, we do not consider such services will provide competitive, quality broadband services to mainstream New Zealand: we note the Government's UFB and RBI programmes have increased the reach of terrestrial broadband services, which now cover 98.2% of Kiwi households¹, and that broadband speeds offered by

¹ <https://www.crowninfrastructure.govt.nz/rural/what/>



satellites are much more greatly affected by the number of users and the atmosphere, and have greater latency than terrestrial services.

Further, we note from a competition and efficiency perspective commercial national broadband providers should be on a level playing field in terms of spectrum costs.

Question 3: What are the spectrum requirements for ESIM use in New Zealand?

We note that the WRC-19 resolution recognised that no additional spectrum (in addition to the 29.5 – 30 GHz spectrum) is required in the 24-30 GHz range.

Question 4: 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?

Yes, 2degrees supports existing fixed services in the 26 GHz band being moved to another band, which could include the 23 GHz and/or 38GHz, where necessary. We note we understand that a large number of these links are in areas where there is fibre and this may be an option also.

We also note there should be no expectation that existing management rights in this band will be renewed: industry has been aware for some years this band is important for 5G services.

As we state in our response to Question 35, however, we do support owners of the existing fixed links seeking a private agreement with relevant management right holders if this is appropriate. For example, this could be the case in more remote areas where mmWave spectrum is not being deployed for IMT use. Alternatively, where operators of fixed links have acquired mmWave spectrum themselves, we support them transitioning their fixed links to their own mmWave frequency bands.

Question 5: If not, do you think the existing fixed services should be allowed in the 26 GHz?

2degrees does not support fixed services remaining in the 26 and 28 GHz band.

Spectrum allocation

Question 6: Do you agree New Zealand should allocate 24.25 - 27.5 GHz primarily for IMT use?

Yes, 2degrees strongly supports the allocation of 24.25-27.5GHz band (n258) to IMT use. It is important that national mobile network operators are able to acquire at least 1 GHz of mmWave spectrum and this is a key IMT band.

Question 7: How should RSM accommodate other use in this band such as space services?

2degrees does not support space applications being considered on a case-by-case basis within this band. 2degrees supports the allocation of this band to IMT use only. We consider



future applications within the band should need the consent of the relevant spectrum management right holder.

Question 8: How do you see our proposal of the 28 GHz band allocation?

2degrees' key concern is ensuring that at least 1 GHz of mmWave spectrum is available for it to acquire and deliver competitive consumer services on. A total of 3.25 GHz spectrum is available from MBIE's current proposed 26 GHz band, which MBIE needs to take into account of when making its 28 GHz allocation decision.

In addition, it is important mmWave spectrum used for mobile is protected from interference, which will otherwise undermine 5G consumer services and efficient use of the band.

These factors support synchronised IMT allocation. Any guard band required to accommodate flexible frame structure should be located where flexible frame structure is implemented.

Allocation of 28 GHz will also support n257 end user devices.

Question 9: 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?

Question 10: If you prefer option 1, do you agree with the proposed sharing mechanism (defining satellite coordination zones) between IMT use and FSS ground stations?

Question 11: 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?

As indicated in our response to Question 8, 2degrees is concerned about potential interference to national management right holders of IMT spectrum. This includes ensuring all users of 28 GHz spectrum do not interfere with users of 26 GHz. We consider this supports synchronised IMT allocation.

If, in contrast to our recommendation, IMT networks in the 28 GHz band were not required to be fully synchronised, then sufficient guard bands would need to be put in place within the 28 GHz spectrum allocations.

The ECC study MBIE has presented in Table 6 states that a 150-900 metre separation is required between systems operating in adjacent channels. However, stricter emission limits and guard bands will be required to avoid harmful interference, which MBIE will need to adopt if New Zealand decides to allow unsynchronised or semi synchronised networked in the 28 GHz band.

A variation of Option 2 is preferable to Option 1.

Question 12: Are there any other issues of sharing use between satellite earth stations and ESIMs that you would like to bring to our attention?

No comment.



Question 13: Do you agree that the current satellite allocation and licensing regime for 29.5 - 30 GHz should remain?

We have no objection with this at this stage, if required.

Question 14: What's your preferred licensing option in 26/28 GHz spectrum?

2degrees supports national management rights for at least the 24.25 - 27.5 GHz IMT band (and possibly the lower end of the 28 GHz – per above). This is required to provide certainty for the large investments that are required to roll out a mmWave network and serve New Zealanders with future 5G mmWave-enabled services.

It is important that any regime RSM chooses does not interfere with any of the national IMT use. GURL arrangements do not provide sufficient certainty regarding interference or availability. For example, as we have previously raised in submissions, the current Radiocommunications Act cannot be relied upon by RSM to prevent interference due to cumulative interference, which would occur with a large number of devices in the 28 GHz band. MBIE must be able to address any interference issues in the case they eventuate.

With 5G enabling massive machine type communication, unprecedented numbers of devices could be using 5G spectrum, with the potential to create interference. MBIE should not adopt a license regime that it is not able to unwind in the event it creates interference.

Question 15: Do you see any need for general user licence spectrum for IMT? If so, what use case might there be?

No, 2degrees does not see a need or support a general user licence spectrum for IMT. We consider a management right regime will deliver the best outcome. This is consistent with the approach RSM has followed in other bands.

2degrees is concerned that under a general user license no party will be held responsible for instances of interference even though IMT in mmWave is likely to experience interference: with a TDD system, potential for interference is high, making the spectrum ill-suited for a general user license regime.

Further, and importantly, any harmful interference issue will not be apparent initially. By the time a cumulative interference issue is apparent MBIE will not have a mechanism to address it.

As noted above, the Radiocommunications Act is also inadequate in these instances, and we consider MBIE must be able to address any interference issues that eventuate.

Question 16: 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?

2degrees does not support general user licenses for IMT.



Question 17: 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?

2degrees would support a band plan based on 3GPP NR FR2.

Technical considerations

Question 18: Do you agree RSM should refer to 3GPP standards to set the regulatory requirements for spectrum allocated to IMT?

2degrees supports RSM referring to 3GPP standards to set the regulatory requirements such as out of band emissions etc. However, we do not support RSM becoming overly prescriptive about what should be deployed etc.

This is because management rights are technology neutral, and management rights holders/operators should be allowed to choose the appropriate technology as technology evolves.

Question 19: 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?

Given technology developments, we consider there may be merit in reviewing AFEL limits at the mid-way point. Generally, the emission levels of subsequent generation of technologies are at a higher level than the previous ones, such that emissions of the newer generation technology may not comply with limits based on older technology.

That said, reviewing the AFEL does not address the underlying issue with the Radiocommunications Act: the assumption that complying with AFEL will avoid interference. Until that is resolved, AFEL is primarily an arbitrary measure to provide only some level of protection.

Question 20: Do you agree RSM should mandate equivalent ETSI harmonised standards for radio licences in Radio Standards Notices and review these standards regularly?

Yes, 2degrees supports ETSI harmonised standards.

Question 21: Which option do you prefer to set the unwanted emissions?

2degrees supports the adoption of Total Radiated Power (TRP) to set unwanted emissions. With the adoption of AAS systems, TRP is the more appropriate measure and it is important that RSM adopts this instead of trying to use EIRP.

In adopting TRP, RSM need to make changes to the Radiocommunications Act to rectify current shortcomings regarding interference, as well as incorporate the TRP concept into the Act. If this is not done, then regardless of whether EIRP or TRP is used, the effectiveness of addressing interference will be limited.



Question 22: If we use a TRP option for setting AFEL and UEL, do you have any recommended solutions on TRP measurement in field?

2degrees does not support the use of EIRP to set AFEL and UEL. As noted by RSM, the proposed options have shortcomings which will lead to undesirable outcomes: using the highest antenna gain value will result in greater interference than anticipated (and the Radiocommunications Act does not provide an adequate remedy for this).

We consider RSM should align with international methods by using TRP. Options to address challenges with TRP measurement in the field could include a form of declaration from relevant vendors confirming that TRP limits are complied with and/or if issues arise, a process to check the emission in a lab environment.

Question 23: Do you agree that RSM should set unwanted emissions limits (in UELs and AFELs) based on 3GPP category B requirements? If no, please explain the reasons and provide your suggestions?

Yes, we agree with this approach.

Question 24: 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.

2degrees supports the implementation of Resolution 750 limits.

Question 25: 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?

Feedback 2degrees has received from vendors indicates **[C-I-C]**

1.

Question 26: Do you agree with RSM's position to not establish a framework for coordination zones for RAS?

2degrees supports RSM's position not to establish a framework for coordination zones. The emission limits established in WRC-19 should provide adequate protection. Placing further restrictions may not necessarily give greater protection, but could result in constraining IMT services.



Question 27: Do you see a need for RSM to allow EESS and SRS earth stations to operate in the band?

No, 2degrees does not support the EESS and SRS operating in the 25.25 – 27 GHz band. We support national management rights in this band, and a receive protection would essentially infringe on the property rights of the management right holder, and unnecessarily limit the deployment of 5G networks in this band.

Question 28: Do you agree a semi-synchronised or unsynchronised network should be used in 5G high band deployment?

No. 2degrees supports synchronised 5G networks in mmWave spectrum (as per the 3.5 GHz band). There are significant costs in supporting a semi-synchronised or unsynchronised 5G network, which we don't think have been fully identified in the RSM paper.

While not synchronising may allow for some increased flexibility for targeted private networks, it will also result in increased interference issues and mitigation steps would be required (for example large guard bands and filtering), which we consider will significantly reduce the benefits available from provision of consumer services over mmWave spectrum and reduce the efficient use of the spectrum.

MBIE's Table 7 needs to be expanded to include key costs in terms of lost capacity in a semi-synchronised or unsynchronised 5G network. At the moment, it also conflicts with information presented in Table 6. The assessment of interference or performance degradation is highly optimistic in favour of semi-synchronised networks.

If MBIE allows the option for semi or unsynchronised networks in the 28GHz band, then guard band and emission restrictions will have to be imposed.

The ECC study results presented in Table 6 shows that a minimum of 150-900 metre separation is required between operators when the two networks are operating in adjacent channels. Generally mobile operators roll out services within the same areas. If a semi-synchronised or unsynchronised 5G network is deployed, when there is conflict between two networks the slots in conflict are essentially unusable.

If a party wishes to operate a semi-synchronised or unsynchronised network, then the necessary interference protections (for example guard bands and filtering) need to come from that spectrum allocation.

Question 29: If the network is unsynchronised, what is the best way to manage the interference between unsynchronised operators?

Question 30: If your preference is a semi-synchronised network, what is your suggestion on setting the synchronized parameter?

2degrees does not support unsynchronised or semi-synchronised networks. However, as per our response to Question 28, any necessary interference protections (for example large guard bands and filtering) need to come from that spectrum allocation.



Question 31: 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?

2degrees does not support RSM implementing ITU Radio Regulations, Resolutions 242.

- As RSM has noted, there has not been any FSS/ISS requests to use this band, indicating a lack of demand to justify this.
- RSM is already proposing to allocate spectrum to fixed satellite use, which is primarily to service rural users. There is a significant amount of spectrum for the volume of users – and more than mobile operators have despite them servicing c.5 million customers and carrying terabytes of data every day.
- This would create increased uncertainty for mobile operators who are planning to invest significant sums of money to roll out services in this band, and are likely to service a much larger number of users. The benefits of keeping this additional ‘option’ open for these potential services does not outweigh the costs.
- There are already restrictions placed on IMT by EESS services and no further restrictions are needed.

Question 32: 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?

2degrees does not support FSS access to the 27 - 27.5GHz band. As noted earlier, RSM is proposing to allocate significant spectrum for satellite services. We do not consider further allocation is necessary nor justified.

Question 33: Do you have any comments regarding the spectrum sharing approach proposed by RSM between FSS and IMT FWA in the 28 GHz band?

No comment.

Question 34: If RSM were to apply an EIRP limit on horizontal plane for FSS, what is the maximum EIRP value we should assume?

No comment.

Question 35: Which option do you prefer for arranging the existing fixed service in the 26 GHz band?

2degrees supports Option 2. As per our response to Question 4, we do not support maintaining fixed link services in the 26 GHz band. Existing fixed links should not be transferred to new mmWave management right without the management right holder’s consent.

We do, however, support owners of the existing fixed links seeking a private agreement with relevant management right holders if this is appropriate. For example, this could be the case in more remote areas where mmWave spectrum is not being deployed for IMT use.



Alternatively, where operators of fixed links have acquired mmWave spectrum themselves, we support them transitioning their fixed links to their own mmWave frequency bands.

Question 36: Do you think RSM should mandate the regulatory requirements as laid out in Resolution 169 9WRC 19) for ESIM use if a shared use between 27.5 – 28.35 GHz?

No comment.