IMSC
INTERIM MĀORI SPECTRUM COMMISSION

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## Exec Summary

Interim Maori Spectrum Commission (IMSC) welcomes the opportunity to provide submission on the Ministry of Business, Innovation and Employment **(MBIE)** Consultation Document, "Managed Spectrum Park Review and Regional/Non-National Allocation" **(the Discussion Document)**.

***Note:*** *This document does not substitute for, nor sets out the IMSC and/or the Māori Spectrum Working Group positions. This paper comments only on the technical implementation of MSP. Any comments or views by the MSWG take precedence over any comments made in this paper.*

Spectrum is a scarce resource and IMSC is keen to ensure that it is used in the most efficient way. With TDD technologies increasingly adopted it is likely TDD technologies will be the technology of choice for Managed Spectrum Parks (MSPs).

Interference potential of TDD technologies is significantly higher than FDD technologies and if these technologies are not managed properly, they have the potential to deny spectrum not only in the operating band, but also in the neighbouring bands. Therefore, it is important that MBIE sets the rules appropriately to ensure that MSP spectrum use does not result in significant spectrum denial.

MSP license data shows that after ten years the MSP is not widely used, ie. the band it not used to its fullest potential. MBIE's assessment concludes that the licensing process has not encouraged more widescale use of this band.

5G experience around world the shows that compromising flexibility (complying with a specified synchronisation scheme) can significantly improve efficiency of spectrum use and the overall benefits from the spectrum is significantly higher. MBIE should adopt synchronisation as a minimum requirement.

Current MSP licensing process is seen by the industry as untidy and difficult to do business with. Synchronised licenses will be easier to coordinate and likely to significantly reduce the time required to find a technical solution.

The licensing requirement does not have a "spectrum denial test" ie. whether a license is creating unjustifiable exclusion zones. Such tests are necessary to ensure that the licensees use the spectrum efficiently.

Lack of interference between FDD and TDD in the 2.5GHz bands has masked potential interference between the adjacent systems. MBIE has not recognised interference to neighbouring bands as a significant issue in this discussion

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document. With MBIE intending to allocate part of 5G band in MSP like allocation it is necessary to ensure that interference between adjacent bands are considered. Synchronisation is a minimum requirement to avoid interference between adjacent TDD bands.

## Introduction

The Interim Maori Spectrum Commission (IMSC) welcomes the opportunity to provide a submission on the Ministry of Business, Innovation and Employment **(MBIE)** Consultation Document, "Managed Spectrum Park Review and Regional/Non-National Allocation" **(the Discussion Document)**.

Spectrum is a scarce resource and IMSC is keen to ensure that it is used in the most efficient way. The rules MSP MBIE will set for the 2.5GHz band will set the precedent for other bands. With MBIE intending MSP type usage in 5G spectrum bands, it is important that these rules are set.

Further, interference to adjacent bands is not considered in the discussion document – this needs to be considered as it is likely to be a key consideration for future MSPs.

## High level comments

### Flexibility vs Efficient use

When MSP was established, the intent was to allow innovation and a range of uses. To enable this there were no specific requirement or restrictions on the technology used by the Licensees. What is apparent is this flexibility has come at a cost – inefficient use of spectrum.

Figure 1 shows the MSP licenses in the four main centres. The numbers in the figure are the license numbers from the national frequency register SMART.

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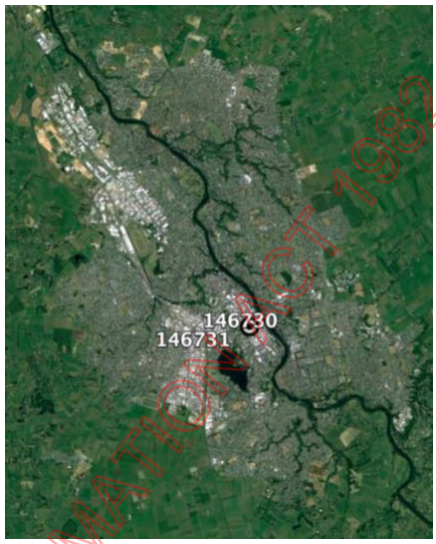
(a) Auckland




(b) Hamilton


(b) Wellington


(d) Christchurch

Figure 1: MSP licenses in the four main centres.

What Figure 1 shows is that MSP is not heavily used in the main centres. MSP license data from SMART shows that MSP use is limited. There are 140 locations where the MSP licenses have been issued.

When MSP was established, the assumption was collaboration was the primary mechanism to allow multiple users within the MSP. However, MSP license data shows that after ten years MSP is not widely used - significantly lower than what this band can potentially offer. MBIE's assessment concludes that the licensing

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process has not encouraged more widescale use of this band. The industry considers the licensing regime untidy where it can be difficult to do business.

5G experience shows that compromising flexibility (complying with a specified synchronisation scheme) can significantly improve efficiency of spectrum use and the overall benefits from the spectrum is significantly higher. If unsynchronised operation is allowed 5G will not be able to achieve the potential it promises.

ITU studies have shown significant distance separation is required when unsynchronised TDD systems operate in the same band. Therefore, synchronisation is necessary to efficiently make use of the spectrum when TDD networks are deployed.

Synchronisation introduces a cost to operators (both interms of implementing synchronisation as well as getting equipment that will comply with timing requirement), however, this is a small price to pay for an efficient use of a scarce resource. Equipment prices have significantly come down since MSP was introduced, making it more affordable now.

Synchronisation also limits flexibility, however, this is a compromise that has to be made to improve better use of spectrum. Currently multiple parties cannot operate in a geographic area unless they are synchronised, thus resulting in significant spectrum denial. Flexibility has resulted in limiting the variety of use, thus not delivering one of the original policy intentions.

## TDD Synchronisation

Section 4.2 of the Managed Spectrum Park Allocation Rules 2015 states:

> **"4.2 Competing Application Groups must seek to agree a Solution**
>
> (a) Competing Applicants must make reasonable efforts to agree among their Competing Application Groups on how they will co-ordinate, revise or modify the specifications of their proposed MSP Licences to accommodate each other's Services on a non-interfering basis and enable the creation of a proposed MSP Licence in the Ministry's SMART system and the issue of ARE Certificates in compliance with the Act and the Engineering Rules (particularly PIB 39) ("a Solution").
>
> (b) A Solution may involve one or more Competing Applicants withdrawing their applications under clause 7.1. Upon withdrawal, an applicant is automatically removed from a Competing Application Group for the purposes of these allocation rules. Solutions may include, without limit, amendments (such as by adopting Licence Conditions) to enable the creation of proposed MSP licences and the issue of ARE Certificates and interference mitigation techniques including antenna discrimination, polarisation, frequency offset, shielding, site selection, and power control. "

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The licenses in MSP use TDD technology and there is no requirement to synchronise. Unsynchronised TDD cannot be easily coordinated. While interference mitigation techniques such as antenna discrimination, polarisation, frequency offset, shielding, site selection, and power control could help with the coordination, without synchronisation, it will be difficult to coordinate all the time. This has been reflected in the difficulties experienced in the coordination process.

Current process creates two outcomes, none of which are satisfactory:

- If a single user is chosen for an area (either because there were the only applicant or the applicant won the lottery) it results in a winner takes all situation. What we have seen is it is difficult to get another license in close proximity thus denying spectrum in that geographical area.
- If a compromised solution is reached by multiple applicants the final solution may not meet the commercial needs of the applicant. This has resulted in long licensing process creating uncertainty and cost to the licensees.

The net result is an outcome that is generally unsatisfactory, which the industry sees as an untidy licensing regime that is difficult to do business with.

Synchronised licenses will be easier to coordinate and likely to significantly reduce the time required to find a technical solution. The solutions proposed in the Managed Spectrum Park Allocation Rules 2015 will be more effective in finding solutions. We encourage MBIE to update the Managed Spectrum Park Allocation Rules to include synchronisation.

## Interference to neighbouring bands

In the case of 2.5GHz band low use in the FDD and TDD bands have masked potential interference between the adjacent systems. With MBIE planning to allocated 5G spectrum for MSP, it is important that the rules are set appropriately to ensure interference between MSP and adjacent bands are avoided.

With TDD technologies increasingly adopted it is likely TDD technologies will be the technology of choice for MSPs. The interference potential of TDD technologies is significantly higher than FDD technologies. If TDD technologies are not managed properly, they have the potential to deny spectrum not only in the operating band, but also in the neighbouring bands. Therefore, it is important that MBIE sets the rules appropriately.

The interference studies carried out in the 3.5GHz band between 5G and WISPs highlighted the potential for spectrum denial between unsynchronised TDD networks.

Synchronisation is a minimum requirement to avoid interference. Synchronisation limits flexibility, however, it provides certainty and faster licensing process. It is

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also necessary to ensure that the equipment used in MSP meets certain timing requirements.

## Responses to Questions

***Question 1:*** *Do you think that co-operation is feasible in the Managed Spectrum Park?*

Co-operation within MSP is possible only if the rules encourage co-operation. Current rules primarily focus technical compatibility where technical compatibility is difficult to achieve (due to lack of synchronisation).

This is further complicated by the fact Radio Communications Act (The Act) provides a first-time advantage to license holders. Parties that are competitors are applying for licenses in the same band and possibly same location, there is no incentive for those who have a first in time advantage to compromise with a party that is a competitor.

Secondly without synchronisation any compromised solution that could be worked out may not meet the commercial needs of the party. In this scenario it is better to chance their luck on the lottery rather than agree to solution that does not meet the commercial requirement.

The licensing requirement does not appear to have a "spectrum denial test" ie. whether a license is creating unjustifiable exclusion zones. Such tests are necessary to ensure that the licensees are using the spectrum efficiently and have a need to co-operate.

We further support full disclosure of technical specifications of equipment used for each licence so that detailed planning can take place.

***Question 2:*** *When considering MSP spectrum allocations, what allocation method(s) would be preferable to you?*

The three options proposed by MBIE are not likely to improve the current spectrum use. The underlying issue is TDD technologies are being deployed without synchronisation or any other restrictions. Without fixing the underlying technical issue, MBIE is not likely to fix the problem or improve the spectrum usage.

Current allocation with methodology that includes

- Synchronisation and
- Limits on spectrum denial

will significantly improve spectrum usage. This will also significantly reduce the efforts required for coordinating between two licensees. Such an approach will

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keep the original intent of innovation and variety of use while fixing the short comings of the current system.

Exclusive allocation could lead to spectrum hoarding and not achieve the original objective of innovation and range of use. Further the intention of MSPs is to encourage a variety of use by different licensees. Exclusive allocation will not encourage variety of use.

MBIE should also take into account the public good and consider mechanisms to help quantify that.

***Question 3:*** *What are your thoughts on the level of technical requirements/rules in relation to MSP licenses?*

Lack of technical requirements contributed to the current situation. MBIE's experience from 3.5GHz should show that TDD systems need to be synchronised to maximise spectrum usage. ITU studies have shown significant distance separation is required when unsynchronised TDD systems operate in the same band.

Regulators around the world have imposed synchronisation of 5G networks as a mandatory requirement. MBIE has imposed mandatory synchronisation on 5G networks in New Zealand.

A similar approach is required in MSP. As we noted earlier, technical requirements are necessary not only to maximise the use of the operating bands, but also to avoid interference to and from neighbouring bands.

MBIE has not recognised interference to neighbouring bands as a significant issue as there has been no significant interference experienced in the 2.5GHz band (due to low usage both in the FDD and TDD systems). However, ITU studies have shown TDD systems has the potential for causing interference. Therefore, it is necessary for MBIE to ensure the rule changes not only increase usage in the MSP band but also protects the neighbouring bands.

MBIE should specify synchronisation and secondly limit the spectrum denial to those customers the licenses are serving. Licenses should not create large exclusion zones denying spectrum in neighbouring areas. MBIE should limit spectrum denial without adequate justification.

We further support full disclosure of technical specifications of equipment used for each licence so that detailed planning can take place.

***Question 4-8:***

IMSC does not have specific comments on regional/non-national allocation or the allocation methodology. However, we have the following general comments:

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- Allocation should continue to ensure a variety of use and encourage multiple parties. There is a need for spectrum to address a variety of needs and this needs to be met. IMSC understands that technical choices may limited the technology choices, however, current IMT technologies can be adopted for variety of use by different parties.
- Any roll out obligations should be meaningful and enforceable. The implementation rules set for 2.5GHz FDD band were difficult to enforce and the net result was some parties managed to meet the roll out obligation without delivering meaningful broadband services. MBIE should be mindful of this.
- Current licensing process could take up to two year to get a license in MSP. If MBIE is looking to encourage regional investments from the likes of WISPs, a two year licensing process will consume a significant portion of their limited resources that could be used for other purposes. There is a need to significantly reduce the licensing time in line with obtaining a Radio License (few weeks).
- Allocation should consider "public good"
- MBIE should consult with the Māori Spectrum Working Group over access by Māori organisations to regional spectrum.
- MBIE should also consider how the allocation of spectrum will enhance skills and capabilities, particularly for Māori in rural areas.

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