SUBMISSION FROM SKY NETWORK TELEVISION LIMITED

TO

THE MINISTRY FOR BUSINESS, INNOVATION AND EMPLOYMENT

RADIO SPECTRUM MANAGEMENT

ON

DRAFT FIVE YEAR SPECTRUM OUTLOOK

March 2017

INTRODUCTION

This is a submission by SKY Network Television Limited (**SKY**) on the Radio Spectrum Management (**RSM**) Draft Five Year Spectrum Outlook.

Any questions regarding this submission should be directed to:

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SKY is grateful for the opportunity to provide a submission on the Draft Spectrum Outlook. Our main concern relates to any redeployment of the 600MHz band for international mobile telecommunications. Set out below are our comments on this key issue that we feel are of the utmost importance to highlight at this stage of the work programme. We can provide RSM with further information if required.

We also make some brief observations about C-Band spectrum on page 8.

KEY CONCERNS WITH REDEPLOYMENT OF THE 600MHZ BAND FOR INTERNATIONAL MOBILE TELECOMMUNICATIONS

1. The delivery of high profile sporting and entertainment events in New Zealand - such as All Blacks Test Matches, Lions Tours and World Cup/Championship events - would be at jeopardy as TV Broadcasters, Radio Broadcasters, Venue Entertainment, Corporate Hosting and Referees/Umpires all currently heavily use the 600MHz band.
2. SKY and other primary users of radio mics have no protection of service at high profile sports events, and have to date relied on voluntary agreements between users. High profile sports events have between 5-10 radio mic user groups, each with ever increasing usage, so voluntary self-management of frequencies is becoming more difficult. In our view, RSM needs to introduce some form of cost-effective user licensing service at these high profile sporting events.
3. SKY would need to invest in any new digital radio mic technology at an estimated cost of between $450,000 to $690,000 - assuming high-end professional equipment with extremely low latency, in frequency bands to suit, is even available. This is a major investment for equipment that is not protected against future spectrum redeployment.

CURRENT REGULATIONS FOR RADIO MIC USAGE IN NEW ZEALAND

For reference, current regulation for radio mic usage is:

- Usage is covered by a General User Spectrum License (GUSL)
- Licence #222922 – covers usage in frequency band 510-606MHz

- Licence #222921 – covers usage in frequency band 622-698MHz
- Maximum power level allowed is -3dBW (500mw)
- All users are classed as Secondary Users of the spectrum, as spectrum is primarily allocated to UHF DTT Broadcasting
- There is also provision within the GUSL for Short Range Devices, for radio mics to operate in the 502-510MHz band, but power levels are restricted to -20dBW (10mw)

We understand that the United States has finalised their Spectrum Incentive Auction. The spectrum between 614 – 698MHz will be offered to interested parties for International Mobile Telecommunications (IMT).

THE IMPACT TO SKY AND OUTSIDE BROADCASTING - SHOULD RSM DECIDE TO ALSO REDEPLOY USAGE OF THE 600MHZ SPECTRUM

- SKY currently has 7 radio mic transmitters in the 600MHz spectrum that operate within the studio and buildings at our Mt Wellington site.
- SKY has an additional 15 radio mic transmitters in the 600MHz spectrum which are used for ENG field recording. 8 of these were purchased for the 2016 Rio Olympics. These radio mics are used anywhere in New Zealand and overseas.
- Outside Broadcasting Ltd (OSB) currently has 56 radio mic transmitters spread across its fleet of OB vans which operate within the 600MHz spectrum. The average cost of equipment used by OSB is $3000 per radio mic, a total investment of $168,000.

If the 600MHz spectrum was redeployed in New Zealand, SKY and OSB would be required to acquire new equipment in legal frequency bands.

Radio mics that could operate in the 510-606MHz band could be a suitable replacement for the 7 systems currently used within the studio or buildings at Mt Wellington.

A thorough evaluation and review would need to be made into the make, model and frequency range of the replacement equipment that would be required to replace the 71 other radio mic systems that are used in ENG kits and by OSB, as these are used right around the country. There are a number of factors that need to be considered, as replacing these with standard radio mic transmitters that operate in the 510-606MHz band would not be suitable for the following reasons:

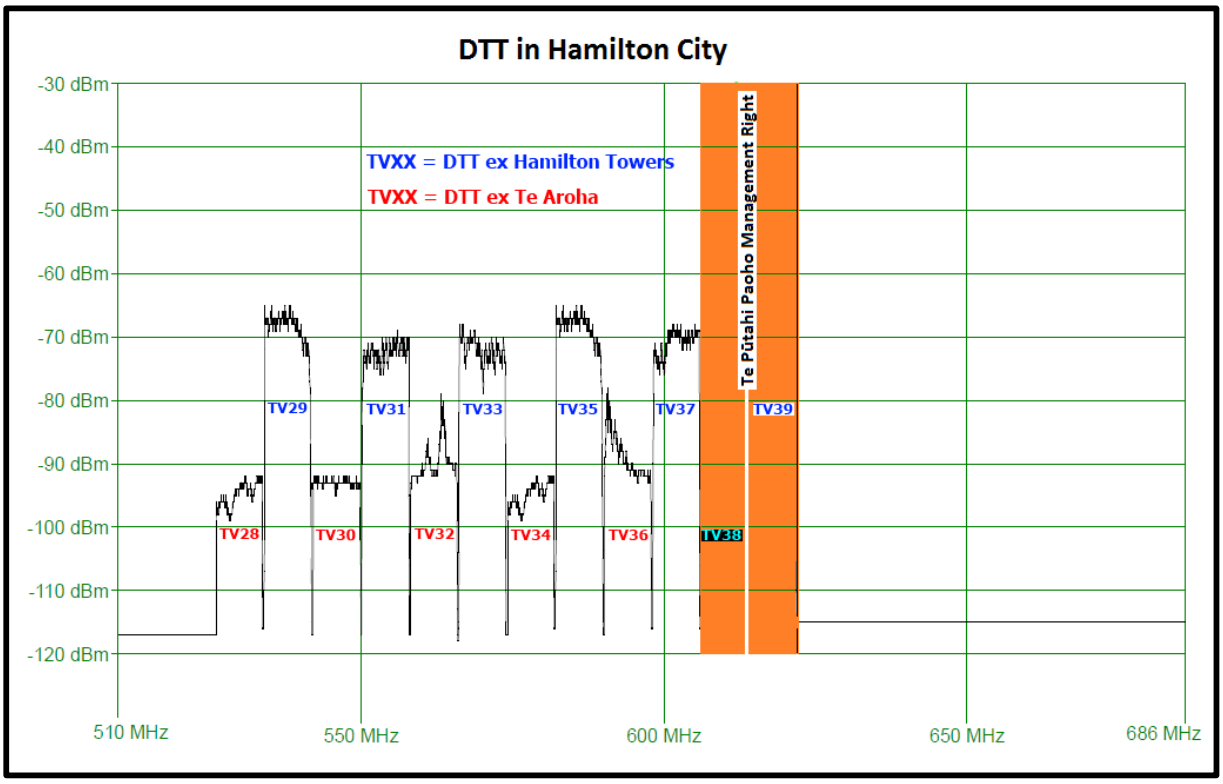
- At best a maximum of 56MHz of clear spectrum would be available for radio mic use in the 510-566MHz band
- There wouldn't be enough clear spectrum to accommodate all users, particularly for large scale events, such as an All Blacks Test Match. Around 75 frequencies are required at a game, and currently 60 of these are within the 622-698MHz band. Other users include Venue Entertainment, Corporate Hosting, Referee Communications and other Radio and Unilateral TV Broadcasters.

- At SKY Sport outside broadcasts, we regularly operate radio microphones over a distance of between 150m - 300m, therefore clear spectrum is required to eliminate unwanted audio artefacts from other competing RF carriers.
- High-end digital radio mic transmitters would need to be seriously considered as the spectrum efficiency they provide would be extremely valuable in congested spectrum, although suitable frequency bands and latency issues would need to be addressed.
- In certain parts of some cities there would be no clean spectrum available in the 510-566MHz band due to convergence of DTT signals from Main and Infill transmitter sites. This would severely affect broadcast coverage of some of premiere sporting events such as All Blacks matches, Super Rugby, International Cricket, NRL Premiership and NRL 9's.

THE IMPACT OF DTT TO USAGE OF RADIO MICS IN THE 500MHZ BAND

SKY and OSB only operate 2 channels for Presenter IFB in the 516-518MHz band. We don't operate any radio mics in the 500MHz band as DTT transmission in geographical locations where both the Main Transmitter and Infill Transmitter sites overlap is problematic for UHF radio mic usage in those areas.

For example, in Hamilton City, the DTT transmissions from both Te Aroha and the Hamilton City infill sites means that at outdoor venues such as FMG Stadium and Seddon Park, there is no usable spectrum between 526MHz and 606MHz.



This situation exists to varying degrees at the following major events stadia:

Albany - QBE Stadium

- **Only 8MHz of usable spectrum**
- DTT occupies 518-606MHz from the Waiatarua & Pinehill TX sites combined
- Affects – All Rugby including All Blacks, Football

Auckland – Eden Park

- **Only 8MHz of usable spectrum**
- DTT occupies 518-606MHz from the Waiatarua & Sky Tower TX sites combined
- Affects – All Rugby including All Blacks, Cricket, NRL 9's

Auckland – Mt Smart Stadium

- **No available usable spectrum**
- DTT occupies 510-606MHz from the Waiatarua & Remuera TX sites combined
- Affects – NRL Premiership, Football

Hamilton – FMG Stadium

- **Only 16MHz of usable spectrum**
- DTT occupies 526-606MHz from the Te Aroha & Hamilton TX sites combined
- Affects – All Rugby including All Blacks, NRL Premiership, Football

Hamilton – Seddon Park

- **Only 16MHz of usable spectrum**
- DTT occupies 526-606MHz from the Te Aroha & Hamilton TX sites combined
- Affects – All Rugby including All Blacks, NRL Premiership, Football

Tauranga – Bay Park

- **Only 16MHz of usable spectrum**
- DTT occupies 526-606MHz from the Te Aroha & Kopukairua TX sites combined
- Affects – All Rugby

Nelson – Trafalgar Park

- **No available usable spectrum**
- DTT occupies 510-606MHz from the Botanical Ridge & Mt Campbell TX sites combined
- Affects – All Rugby

UHF SPECTRUM SQUEEZE

The usage of UHF radio mics is increasing and for major events the current 622-698MHz spectrum is currently being used at capacity. Intermodulation (IMD) software indicates that in this 76MHz bandwidth, up to 32 frequencies can operate without any IMD issues.

Digital radio mics do offer efficiency of spectrum usage, but there are latency issues for high end users that manufacturers are still working on. Availability of equipment in suitable frequency bands would be dependent on what manufacturers release to the New Zealand market. The cost of digital radio mics is significantly more, which not all users would be able to afford.

Currently at a typical All Blacks match at Eden Park demand is such that approximately 75 frequencies are allocated to all users. This is done by allowing low level IMD products. If users were limited to just the 500MHz spectrum, then as indicated above, the available 8MHz of spectrum at Eden Park is nowhere near enough.

A chart showing the typical radio mic UHF spectrum usage at high profile sports events in New Zealand is included in Appendix 1.

It should also be noted that currently there is no official regime for radio mic frequency co-ordination at high profile sport events. Much of the co-ordination has been done voluntarily without any official mandate and relies on the goodwill of all users. Every user onsite is able to be accommodated in the current environment, but if users are required to move to narrower bandwidths of spectrum, that goodwill may not exist and debates will rage over who has priority.

COSTS INCURRED PREVIOUSLY FROM THE 700MHZ REDEPLOYMENT

In 2014, RSM sold the Management Rights to the 700MHz spectrum as part of the Digital Dividend. Both SKY and OSB held significant inventory of radio mics in that band, and therefore we were required to spend considerable amounts to acquire or re-channel radio mics to legal frequencies.

COST TO REPLACE CURRENT RADIO MICS TO VACATE 600MHZ SPECTRUM

SKY and OSB would need to look at the latest digital technology in radio mics in order to meet demands of production and events within the increasingly congested UHF spectrum. Some of these digital systems can cost up to $10,000 per radio mic.

- OSB – 56 radio mics – between $400,000 to $600,000
- SKY Studio/Building – 7 radio mics – between $25,000 and $45,000
- SKY ENG kits – 15 radio mics – between $25,000 and $45,000

WHICH FREQUENCY BAND CAN WE SHIFT TO?

If the 600MHz band was redeployed for IMT use, we would find it difficult or impossible at some venues to operate in the 500MHz band. There are currently very few other available frequency bands that we could move to.

Other issues to consider is the availability of equipment to suit the legal bands in New Zealand. We are heavily reliant on international manufacturers who make systems for the major markets, so if RSM were to follow the United States' lead, then we would need to look at what equipment is made for the US market. Apart from the current 500MHz and 600MHz bands, the following bands are also used in the USA:

- 470-516MHz band. It would be illegal for us to operate below 502MHz
- 944-960MHz. In NZ used by telcos (Vodafone & 2degrees) for cellular (935-960MHz)
- There is some equipment in New Zealand that operates in the DECT and WiFi bands, but but it is not suitable for high end professional use as it is generally prosumer or conference equipment designed for very short range use.

RSM would need to identify or release other frequency bands for radio mic users and also look to some form of licensed user system, so as that broadcasters, such as SKY, have some protection when using radio mics.

DYNAMIC SPECTRUM ACCESS AND TELEVISION WHITE SPACE DEVICES

The concept of Dynamic Spectrum Access (DSA) for such things as Television White Space Devices (TVWS) also threatens reliable usage of radio mics. These devices are required to reference the spectrum database to determine frequency gaps in the UHF TV Band. Current radio mic usage is not listed in any database, so these devices would interfere with radio mics.

Even if these TVWS devices were cognitive, there is still the threat that the TVWS device could suddenly occupy a radio mic frequency, during a battery change or if the radio mic transmitter goes out of range (say into a dressing room).

Although we understand RSM has no medium term intention of implementing such Spectrum Sharing mechanisms, some trials are currently being conducted in New Zealand. The impact of these devices on radio mics should also be tested. This again raises the need for RSM to introduce licensing of radio mics so as that frequencies are listed in the database that the TVWS device is referencing.

ALLOCATIONS IN THE C-BAND

We note the reference on page 13 of the Draft Spectrum Outlook to RSM working on the "replanning of the additional IMT allocations in the C-band (3.4-3.6GHz)… in order to assess future options for the New Zealand market".

As broadcasters of C-band transmission, we ask that we are kept informed of developments in this area, and would be happy to answer any questions about our current usage. We set out the main points below.

Satellite broadcasting requirements

The main focus for satellite broadcasting is protecting the ability to uplink/downlink from the three sites that SKY currently operate from: Mt Wellington, Albany, and Warkworth Earth Station.

SKY currently has transmit licenses to uplink from Mt Wellington and Warkworth operating in the Ku-Band frequency range, transmission in the 14GHz spectrum and reception in the 10-12GHz spectrum.

SKY operates a Pay TV service that incorporates accessing channels from a number of geostationary satellites and delivering them to our customers using channel Bouquets. These downlinked channels are delivered using both Ku-Band and C-Band frequency ranges.

The potential impact to Sky Network Television, should RSM decide to replan the 3.3-3.4GHz, 3.6-3.7GHz spectrum

Sky currently downlinks C-Band services via 10 antennae located at Mt Wellington, Albany and Warkworth Earth Station.

An inability to receive these services would mean requiring access via other means (international fibre) or changing satellites.

Both would be extremely costly.

Following some interference to our downlinked C-band services at Mt Wellington in 2011, SKY had to purchase band pass filters for a number of C-band antennae.

In 2015 there was also Wi-Max interference observed at the Warkworth Earth Station that affected our C-band downlink from Asiasat 7 at 105.5 East. This was resolved by Kordia ceasing transmission of its own internal Wi-Max intranet.