

**ELEPHANT
AUDIO
LTD**

13 Heversham Place
Glendene
Auckland 0602
New Zealand
Ph +64 27 4852205
Fax +64 9 8133180
hbhana@elephantaudio.co.nz

Submission in response to

**UHF Radiomicrophones:
Opportunities for future use**

25 June 2013

Radio Spectrum Policy & Planning
Infrastructure and Resource Markets
Ministry of Business, Innovation and Employment
PO Box 1473
Wellington

25 June 2013

Re: UHF Radiomicrophones: Opportunities for Future Use

Thank-you for the opportunity to submit comments on the changes that are occurring to the UHF radio spectrum which will affect the operation of radio microphones and other wireless communication devices in the 510-806MHz frequency range.

Introduction:

I have been in the television broadcast industry for over 27 years, with the majority of these years engaged as a sound engineer involved with live sports, news and entertainment productions.

For the past 8 years, I have been closely involved in coordinating the UHF radio microphone frequencies used at a number of sporting events around New Zealand. I have generally done this on a voluntary basis, even though I am a freelance engineer. This was borne about as on a typical rugby match there were up to 4 or 5 different users all operating a combined total of up to 20 UHF wireless devices, yet there was no co-ordination between these parties and as testing often took place at different times during the day, it inevitably resulted in a number of issues at the start of the game.

Today on a major All Blacks Test match there could be up to 10 users on-site using in total anything between 30-50 UHF wireless devices. Without a coordinated frequency plan there would undoubtedly be a high chance of interference which could affect the running of the game, as match referees also rely on UHF wireless devices for communication.

The reliable usage of radio microphones in the future is extremely important for a large number of users, but the I fear that the opportunities for future use is extremely limited or potentially impossible in some areas of New Zealand especially for News Organisations, Film and TV Production, Touring Concerts and organisers of outdoor sporting events. These concerns are outlined further in this submission.

In addition to the submission document questions, I have also added comments in response to the various section headings and sub-headings.

Submission Responses:

4. What are Radiomicrophones?

Consideration should be given to more accurately describe the devices that actually use the UHF spectrum under the guise of radiomicrophones. As indicated in the submission document In-Ear monitors also use radio microphone technology. The submission document makes no mention of wireless intercom devices or transceivers that also use the UHF spectrum. These devices are used extensively in the theatre and entertainment industry primarily for crew communications.

Terminology such as Wireless Audio Transmitters (WAT) or Low Power Audio Transmitters (LPAT) would probably be more appropriate to encompass all devices that use the spectrum.

4.1 What frequencies can Radiomicrophones currently use?

I thank the ministry for listening to industry concerns back in 2009, which resulted in the creation of the additional GUSL's to allow radio microphone usage in 518-582 and 614-646MHz ranges.

The GUSL conditions state that a maximum power level of -20dBW (10mW) EIRP should not be exceeded in areas where licensed services exist. Given that this specification was devised in an era purely of analogue TV receivers, would a higher power level now be more appropriate, as it is generally acknowledged that the performance of digital TV transmissions is more robust from interference.

It should also be taken into consideration that a large number of radio microphone transmitters that are in current use are not able to be switched to the 10mW power level. A number of these transmitters have fixed power levels between 30 and 100mW, so the maximum power level of 10mW needs to be re-examined. In the past 6 years, I am not aware of any reports of interference to UHF television services caused by radio microphones operating above the 10mW limit.

An exemption or relaxation of the maximum power level should be included for users who operate indoors, where they have a degree of isolation or RF shielding. Such typical users are theatres, convention centres, indoor sports arenas and TV studio's.

5.1.1 Cessation of Radiomicrophone use in the digital dividend after 11 March 2015.

Question 1

Do you agree with allowing radio microphones to continue operation in the 703 – 806 MHz band until 11 March 2015 to allow a phase out period, noting that radiomicrophones must cease operation if they are causing interference? If not, why?

In principle, I agree that radio microphones be allowed to operate in the 703-806MHz band until 11 March 2015. There are a number of users across New Zealand who have considerable assets in this frequency range and some of them need time to build their finances to acquire compliant transmitters for the future.

With the effects of the Canterbury earthquake and the Global Financial Crisis, a number of organisations and users have had to delay such capital purchases. Some users have also been unable to purchase new hardware due to the uncertainties around the final DTT allocation by broadcasters who have yet to decide their option to convert their Analogue TV licences to Digital.

I would also propose that radio microphones be allowed to operate beyond 11 March 2015 in the proposed guard bands within the 700MHz digital dividend spectrum.

Given that the relevant GUSL does expire on 11 March 2015, there are still some sellers who are actively selling transmitters that operate purely within the 703-806MHz band. Australia is discontinuing use in December 2014 in this band, so steps need to be taken to prevent unsuspecting buyers from buying such equipment which may be offered cheaply.

I firmly believe that the importation and sales of equipment which exclusively operate within the 703-806MHz spectrum needs to be banned as soon as possible to prevent unwary buyers from buying equipment that could be rendered unusable possibly as early as within the next 12 months. MBIE need to address this issue with haste.

5.2 Television broadcasting.

I support the proposal to extend the GUSL for radiomicrophones to the lower limit of 510MHz. It is noted though that [PIB21](#) shows the UHF TV band as starting at 502MHz. I would ask that consideration be given to extend the lower band limit of the relevant GUSL to 502MHz.

5.3 Māori Television Service (Te Aratuku Whakaata Irirangi Māori) Amendment Bill 2012.

I acknowledge that the Crown can only issue licences for spectrum they own and that when the management rights for the spectrum between 606-622MHz is transferred to Te Pūtahi Paoho, the GUSL for radio microphone usage in the 614-686MHz band will be modified to exclude the 614-622MHz band.

I would request that the ministry approach Te Pūtahi Paoho on behalf of all current radio mic users, and actively encourage them to issue their own General Licence that would allow the continued usage of radio microphones under the same conditions as the Crown issued GUSL. In 2009 and 2010, the [WUNZ](#) group made several requests to Maori Television Service for approvals to legally operate radio microphones within the Management Right they hold in the 582-614MHz band. No responses were ever received to any of these requests.

The spectrum above 614MHz was opened up for radiomicrophone use in 2009 and a number of owners vacated the 700MHz spectrum early and made capital investment in this band. It seems unfair for these owners to be suddenly left with relatively new equipment that may not be able to be used in 5 months time.

It should also be noted that in the UK, their TV Channel 38 is set aside for shared radiomicrophone use. These frequencies are between 606.500 and 613.500, so access to the 606-622MHz band for radiomicrophone use is useful for TV crews from the UK.

6. Could Radiomicrophones use the APT guard bands?

Question 2

Do you agree with permitting the operation of radio microphones at low power in the 698 – 703 MHz band (–20dBW / 10mW EIRP) on a non-interference basis?

Although I do agree with allowing the operation of radio microphones in the 698-703MHz Guard Band, I would prefer that tests were conducted as soon as possible to determine the maximum power levels permissible, rather than wait for international trends to develop. The onus would still be on the radio microphone operator to use their device on a non-interference basis.

A number of years ago, I understand that Telecom Mobile users suffered interference from a particular model of radio microphone, resulting in a Prohibited Equipment Notice. Given that incident occurred whilst Telecom were using analogue technology, and that the specific radio mic transmitter was operating within Telecom's Management Right frequencies, we need to get a more accurate indication of the safe operating levels to allow radio mics to be used in the guard bands.

It should also be taken into consideration that a large number of radio microphone transmitters that are in current use are not able to be switched to the 10mW power

level. Most of these transmitters have fixed power levels between 30 and 100mW, so need to question if the maximum power level of 10mW is still an appropriate level.

Question 3

Noting the possibility of degradation from cellular mobiles, is providing for radio microphone use in the 698 – 703 MHz band useful to radiomicrophone users?

For some users, the spectrum between 698-703MHz would still be useful, especially in areas where there is limited, restricted or no cellular mobile usage. Such places could be TV studio and remote locations. This would possible negate these users from potentially having to replace their hardware unnecessarily.

7. Digital Radiomicrophones

Question 4

Do you agree with allowing digital radio microphones? What types of emissions / modulation and emission bandwidths would be appropriate?

In principle I agree with allowing digital radio microphones. The emissions, modulation and emission bandwidths are beyond my current level of knowledge.

8. Standards applicable to Radiomicrophones

Question 5

Are there any other performance standards that should be listed in the 'Radiocommunications (Radio Standards) Notice 2010'?

I am not currently aware of any other radio standards that need to be added.

9. What is happening in Australia?

Australia is discontinuing usage in the 694-820MHz band from 31 December 2014. Some New Zealand buyers will undoubtedly be tempted to purchase any surplus radio microphones at bargain prices. These buyers would most likely be unaware that the GUSL for this band expires in March 2015.

I firmly believe that the importation and sales of equipment which exclusively operate within the 703-806MHz spectrum needs to be banned as soon as possible to prevent unwary buyers from buying equipment that could be rendered unusable possibly as early as within the next 12 months. MBIE need to address this issue with haste.

General Comments

SMART Database

The online SMART search engine needs to be more user friendly. As a radio mic user who travels around New Zealand, I want to know what licensed frequencies are operating in certain cities. Unfortunately the search engine doesn't have the facility to search a city or region. This type of search can only be done by entering the transmitter site name which obviously requires the user to have intimate knowledge about transmitter sites in an area. For overseas users who are looking to use radio mics in New Zealand, the search engine is too complicated. The alternative search engine that used to exist a number of years ago (Spectrum Online?) used to have the facility to search via regions. This functionality and possibly a search via postcodes needs to be added to SMART.

Frequency agility of transmitters

The industry requires some clarification in regards to the operating bands of transmitters, as there is some confusion as to what is considered legal usage.

All modern radio mic transmitters are frequency agile, although the switching bandwidth does vary between manufacturers and models. This variance is typically between 16MHz and 50MHz with some transmitters having a predefined group of frequencies and other transmitters that can be set to any frequency in the band in either 25kHz, 50kHz or 100kHz steps again dependant on the model of radio microphone.

Assuming that a GUSL is issued for radio mic usage in the 510-606MHz band, but a radio microphone transmitter is capable of operating on frequencies between 582-614MHz, would this transmitter be outright illegal to use in New Zealand, or do the Licence Conditions still allow usage on the proviso that the operating frequencies are within the limits stipulated within the GUSL?

Creating certainty for radio microphone users

A number of radio microphone distributors are still left wondering what frequency bands are best to import and sell for long-term future use, especially to users who travel extensively throughout New Zealand.

Prior to the introduction of Digital Terrestrial Television (DTT), it was still practical for radio mic users to operate their devices within an analogue TV channel, as there was white space either side of the vision and sound carrier frequencies. DTT doesn't allow radio mic users this flexibility as the entire 8MHz band of a TV channel is occupied by the DTT transmission signal.

I read with interest the following on page 13 of the discussion document.

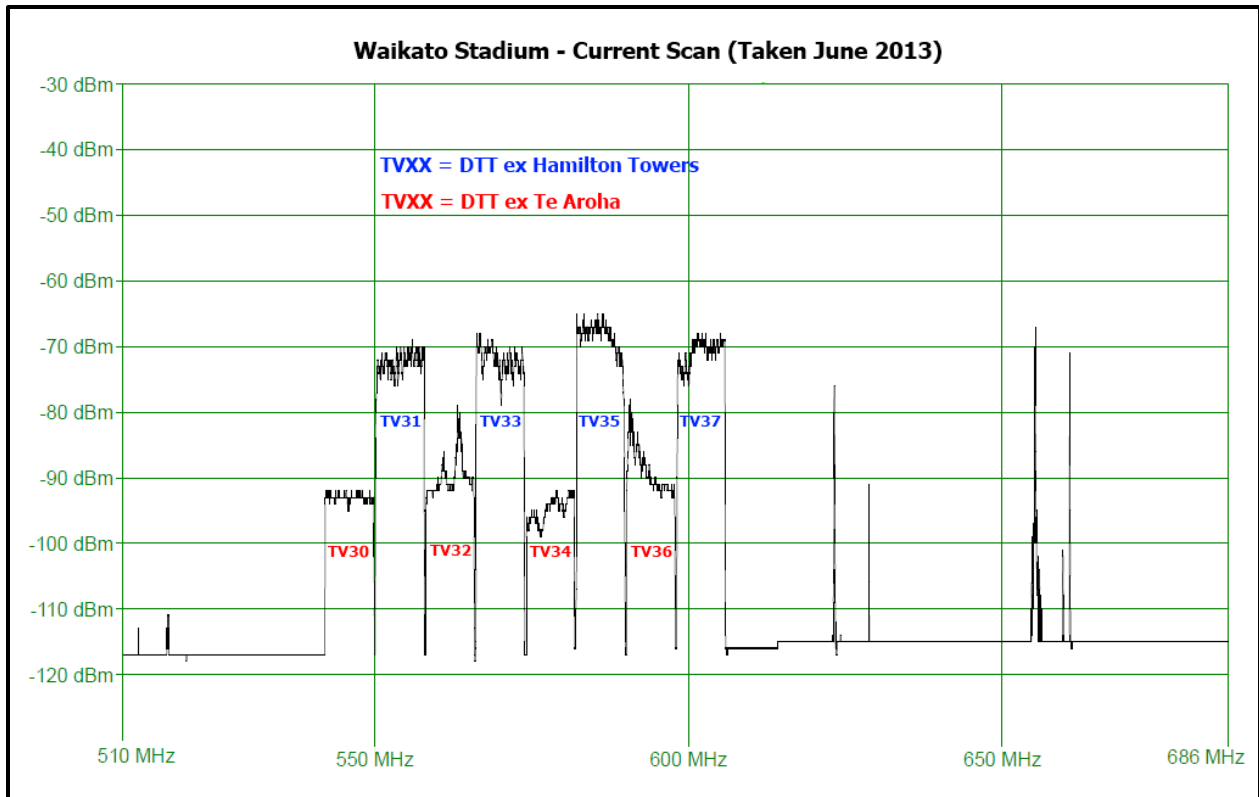
"Before 2009, radiomicrophones had 160 MHz available to them in the UHF television band. Although the frequency ranges will be different, after these changes radiomicrophones will be permitted to use 177 MHz of the remaining television spectrum."

A clear distinction needs to be made between "available or licensed" spectrum and useable spectrum. Although 176MHz of UHF spectrum is marked as available, not all of this spectrum is useable in most areas of New Zealand.

Where areas are only serviced by a main DTT transmitter site, then up to 88MHz of spectrum would be useable and most frequency agile radio mic systems would be able to work around this. For a high number of users, who use their radio mics as part of a fixed installation, i.e. Church's, Gyms and Schools then this should not be a problem.

There are a couple of geographical areas of significance where due to infill DTT transmitter sites the amount of useable UHF spectrum for future radio mic use could be less than 16MHz. Such locations are Eden Park in Auckland, North Harbour Stadium in Albany and in Hamilton City where sporting venues such as Waikato Stadium (Rugby) and Seddon Park (Cricket) are affected. Any major sporting event or entertainment event at these venues is in jeopardy in the future.

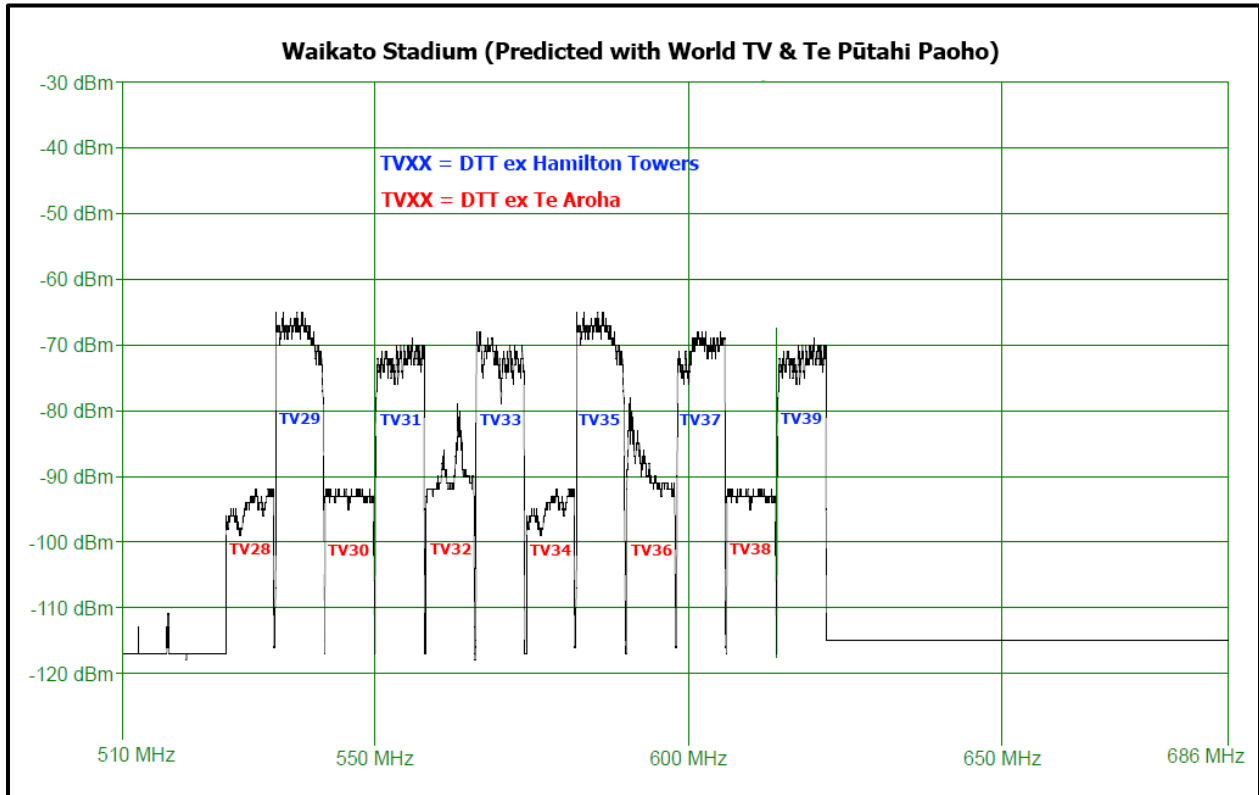
The following pages show a recent RF scan taken at Waikato Stadium and also mock scans of what the future could hold for DTT transmissions resulting in the drastically reduced useable UHF spectrum for radio microphones.



This scan shows a contiguous block of 64MHz occupied by DTT transmissions, but has usable spectrum between 510-542MHz and 614-686MHz

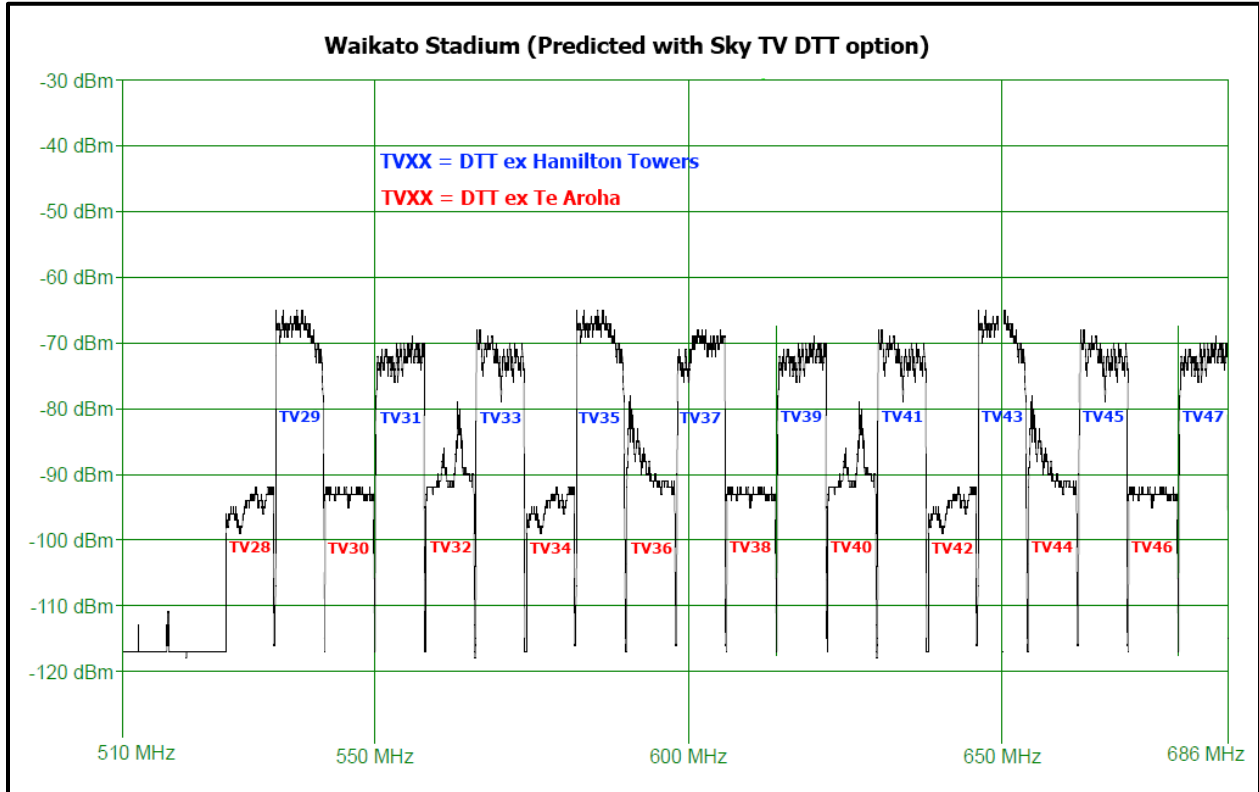
Although DTV licences exist within the SMART database for World TV on TV28 & TV29, the scan did not detect any DTT type transmissions on the relevant frequency bands in the Waikato area.

As per the discussion document, Te Pūtahi Paoho would be allocated TV38 & TV39. Factoring in the World TV licences, the spectrum is currently expected to look as follows:



Radio mic users can expect 96MHz of contiguous spectrum occupied by DTT transmissions, but still has usable spectrum between 510-526MHz and 622-686MHz

Although not highlighted in the discussion document, it is my understanding that Sky Network Television has yet to declare their intention to convert their current UHF Analogue TV licences to Digital. They currently have remaining 4 analogue TV licences which would entitle them to 8 digital channels. If this were to happen then the entire UHF TV band spectrum could be occupied by DTT transmissions.



Where is the useable UHF spectrum for radio mics?

Based on the current allocation of DTT channels, it would appear that the long term allocations would be as follows:

- TV26 & TV27 – Independent Broadcasters*
- TV28 & TV29 – World TV
- TV30 & TV31 – Sky TV/TVNZ (Igloo)
- TV32 & TV33 – TV Works
- TV34 & TV35 – TVNZ
- TV36 & TV37 – Kordia & JDA
- TV38 & TV39 - Te Pūtahi Paoho
- TV40 & TV41 – Sky TV
- TV41 & TV43 – Sky TV
- TV44 & TV45 – Sky TV
- TV46 & TV47 – Sky TV

*If an Independent Broadcaster was granted a licence in Hamilton, then there would be no useable spectrum for radio microphone usage.

Even if Sky TV handed back their analogue TV licences to the ministry, the radio mic industry fears that these licences could be brought by existing broadcasters or by a new provider, resulting in fully occupied spectrum.


There are a considerable number of "high profile" users who need to plan their radio mic frequency selection based on the least usable amount of spectrum. Such users are News Crews, Touring Concerts, PA Companies, Outside Broadcast providers, Referee/Umpire Communication providers and TV Crews. These users can be in a different location on different days, or in the case of a News Crew, can be in multiple locations on the same day and are often despatched to any region of New Zealand without notice. These users typically need 1 set of equipment that can be used nationally. 16MHz of spectrum would not be enough for some of these users to operate their radio microphones, hence why sporting and entertainment events at Eden Park, North Harbour Stadium, Waikato Stadium and Seddon Park are in jeopardy as at times anything between 20-50 radio mic transmitters are used.

The opportunities for future use of radio microphones in such areas is extremely limited and bordering on impossible.

The ministry needs to address how radio mic users would be able to operate in regions where all but 16MHz of the UHF TV band is likely to be occupied by DTT transmissions.

Should you have any questions or require any further information about the contents of this submission, then please do not hesitate to contact me.

Yours sincerely



Haresh Bhana
Elephant Audio Ltd
hbhana@elephantaudio.co.nz
Ph 027 4852205