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Ministry of Business, Innovation & Employment

UHF Radiomicrophones:
Opportunities for future use

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1. Executive summary

This discussion document outlines the changes that are occurring to radio spectrum usage that will affect radiomicrophones operating in the 518 – 806 MHz frequency range.

The need for change to the frequency range in which radiomicrophones operate is being driven by:

- The frequency range 698 – 806 MHz is being freed up for mobile broadband;
- changes to television broadcasting; and
- changes to the Māori television service spectrum allocations.

This document makes specific proposals on the frequency ranges and limitations that radiomicrophones will be operate under in the future. These proposals are illustrated in figure 1.

Figure 1: Shows the proposed changes for radiomicrophones.

2. Consultation Process and Timeframe

2.1 Making a Submission

Comments should be submitted in writing, no later than 5pm on 25 June 2013, as follows:

Email (preferred)

radiospectrum@med.govt.nz (Subject line: "UHF Radiomicrophones")

Post
UHF Radiomicrophones
Radio Spectrum Policy and Planning
Infrastructure and Resource Markets
Ministry of Business, Innovation and Employment
PO Box 1473
WELLINGTON

2.2 Publication and Public Release of Submissions

Our intention is to publish all submissions on the Ministry of Business, Innovation and Employment ('The Ministry') website at www.rsm.govt.nz. Submitters will be considered to have consented to publication unless clearly specified otherwise in the submission.

If parties wish to make points which are commercially sensitive, these should be submitted as a suitably labelled appendix. This will assist us to easily take out such material.

Submitters should also be aware that the content of submissions provided may become subject to public release under the Official Information Act 1982. Please advise us if you have any objection to the release of any information contained in a submission, and in particular, which part(s) you consider should be withheld, together with the reason(s) for withholding the information. Confidential information should be clearly marked. The Ministry will take into account all such objections when responding to requests for information on submissions to this document under the Official Information Act 1982.

The Privacy Act 1993 establishes certain principles with respect to the collection, use, and disclosure of information about individuals by various agencies including the Ministry. It also governs access by individuals to information about themselves held by agencies. Any personal information you supply to the Ministry in the course of making a submission will be used by the Ministry only in conjunction with consideration of matters covered by this document. Please clearly indicate in your submission if you do not wish your name to be included in any summary of submissions that the Ministry may publish.

3. Purpose

This discussion document outlines changes and presents future options for radiomicrophones using 518 – 806 MHz UHF spectrum. This follows the Government's recent announcement that it plans to auction the 'digital dividend' radio spectrum in the 700 MHz band later this year.

This document does not consider radiomicrophone use in other bands such as VHF band III (174 - 230 MHz) or the various bands available under the General User Radio Licence for Short Range Devices (GURL-SRD). At this stage radiomicrophone use in these bands remains unchanged. However, the Ministry of Business, Innovation and Employment ('The Ministry') has proposed that VHF Band III be reviewed in the future and radiomicrophone usage will be looked at in this review.

The document seeks the opinions of interested parties on the analysis and options presented relating to UHF radiomicrophones.

4. What are Radiomicrophones?

Radiomicrophones are short range devices that use radio waves to transmit sound (voice, music, etc.) from a microphone to a nearby receiver where it is used in audio reproduction. They are widely used by individuals and professionals in applications such as entertainment, broadcasting, community groups, special events and public speaking. In addition radiomicrophone technology is used for "in ear" monitors (for example by referees in a sports game). Radiomicrophones are also known as wireless microphones or wireless audio transmitters.

Radiomicrophones typically operate within the frequency bands used for television and utilise gaps in the radio frequency spectrum which is not being used for television in a given area. Radiomicrophones operate under a General User Spectrum Licence (GUSL) on a secondary, non-interference basis where they must tolerate interference and must not cause interference to licenced services. No fee is charged for the use of spectrum under the GUSL.

As with any General User Licence, the Ministry is unaware of either the frequency selected by a user or the required area of operation. Satisfactory operation of the radiomicrophones, and avoidance of interference to other services, is the user responsibility. It is therefore important that radiomicrophone equipment is flexible in regard to its use of spectrum and can be changed to use different frequencies if needed. Changes in the use of the radio frequency spectrum can also occur over time. Radiomicrophones that have no inbuilt flexibility may risk some disruption, particularly as television usage changes and evolves and as the digital dividend is implemented.

4.1 What frequencies can Radiomicrophones currently use?

Radiomicrophones are currently permitted to operate within the UHF television bands under three different General User Spectrum Licences (GUSL). The three frequency bands are all within Crown owned Management Rights. A summary of the current licences and provisions is available in the following table:

Table 1: Summary of the licences and provisions available to radiomicrophones.

Frequency Range	Permitted modulation	Maximum EIRP	Licence number	Expiry
518 – 582 MHz	FM (300KF3EJN)	-3 dBW (500 mW)	222922	11 March 2020
614 – 686 MHz	FM (300KF3EJN)	-3 dBW (500 mW)	222921	11 March 2020
686 – 806 MHz	FM (300KF3EJN)	-3 dBW (500 mW)	222923	11 March 2015

Radiomicrophones can normally transmit up to a power of -20 dBW (10 mW) EIRP. However, if the radiomicrophone operator first determines the absence of existing licensed services in the proposed area of operation, they may operate above -20 dBW (10 mW) EIRP, up to -3 dBW (500 mW) EIRP. This determination can be made by accessing the Ministry's online SMART database of radio licences.

Copies of the GUSLs in the table above can be found in SMART. See www.rsm.govt.nz

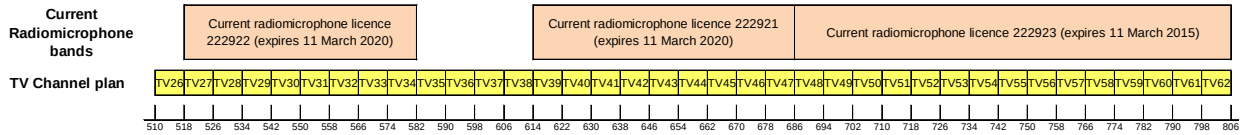

Figure 2: Current radiomicrophone General User Spectrum Licences compared with the television channel plan

Before 2009 the frequency range 646 – 806 MHz was all that was available for UHF radiomicrophones. The 518 – 582 MHz and 614 – 646 MHz frequency ranges have subsequently been added.

5. Need for change

There are several reasons why it is necessary to change the current licences that permit use of radiomicrophones. These include:

- the allocation of management rights to private owners for the 'digital dividend' spectrum between 703 – 748 MHz / 758 – 803 MHz and the anticipated use of this spectrum for mobile broadband;
- associated changes in television broadcasting from analogue to digital (the 'digital switch-over'); and,
- the expiry of the Management Right owned by the Māori Television Service (Right No 195) on 30 November 2013 and the provision of a new Management Right thereafter under the Māori Television Service (Te Aratuku Whakaata Irirangi Māori) Amendment Bill 2012.

These changes are a part of the overall process of transition to digital television and freeing up spectrum for new uses. This transition process has been occurring since the introduction of digital television in 2008 and will be completed with the final stage of the digital switchover on 30 November 2013.

5.1 The digital dividend

The ‘digital dividend’ refers to the part of the radiofrequency spectrum that is able to be freed up following the switch from analogue to digital television broadcasting. The freed-up spectrum is then able to be allocated to new uses. The switchover is taking place across the world. Various countries have either already completed, or are mid-way through, the move to digital television. Different regions around the world are releasing slightly different spectrum bands and allowing a range of services in these bands, although most are allocating the majority of the digital dividend spectrum to cellular use.

The New Zealand Government recently announced its intention to allocate the 700 MHz band in the third quarter of 2013. Cabinet has agreed that the spectrum will be allocated through an auction, and that the spectrum will be organised in blocks according to the Asia Pacific Telecommunity (APT) band plan for FDD (Frequency Division Duplex) services.

The APT FDD band plan consists of 45 MHz paired, with a 10 MHz centre gap, a 5 MHz lower guard band, and a 3 MHz upper guard band (shown in the hatched sections in the diagram below).

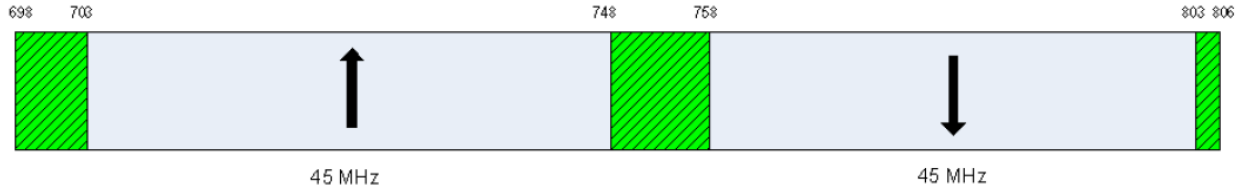

Figure 3: The APT band plan for the 700 MHz band

Radiomicrophones and the new services expected to use the digital dividend (mobile broadband) cannot co-exist in the long term. Radiomicrophones will therefore need to cease using the digital dividend spectrum.

The Ministry has already provided additional spectrum within the television broadcasting bands for radiomicrophones. This is 96 MHz more spectrum than what was available before 2009. In 2009 an additional 64 MHz (518 – 582 MHz) was provided. Then in 2010 an additional 32 MHz (614 – 646 MHz) was provided. These new assignments were to assist with radiomicrophone transition out of the digital dividend spectrum (698 – 806 MHz).

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

The Ministry proposes that radiomicrophones be able to continue use on a licence with similar parameters to licence number 222923 within the digital dividend until the present licence expiry date of 11 March 2015. In other words, there is no change proposed to radiomicrophone conditions of use until 11 March 2015. This will give radiomicrophone users more time to migrate to other spectrum without causing difficulty to new services in the 700 MHz band. This cessation of use by radiomicrophones was foreshadowed in 2010 when the short term General User Spectrum Licence was created, even though the timing of the digital switchover and auction of the digital dividend was not known at that date.

Any new management rights in the 700 MHz digital dividend spectrum will commence on 1 January 2014. From this date the successful bidders can begin to deploy services. It is expected that the deployment of services will take some time and is likely to happen region by region.

It is likely that much of the 700 MHz band will be used to deploy LTE[1] cellular services, also known as 4G, although this is dependent on which service providers are successful in the auction. Radiomicrophones will be unable to operate in the presence of cellular services. It will be evident to radiomicrophone users if a cellular service has been deployed in the area as the radiomicrophones will either receive audible interference or no longer be able to be used. Radiomicrophones must not cause interference to licenced services; if a cellular service is deployed in an area radiomicrophones in that area should cease operation.

If radiomicrophone usage is to continue in the digital dividend until 11 March 2015 a general user spectrum licence will be included as an incumbent licence in any new management rights up for auction. This will have the same conditions as the existing licence and the same expiry date of 11 March 2015. Under this scenario, radiomicrophones will be able to continue using the digital dividend spectrum until the holders of management rights actually deploy services in any given area. It is likely that full nationwide service deployment will take some time, although this may vary between different operators.

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?

5.2 Television broadcasting

Digital terrestrial television was introduced to New Zealand in 2008. At that time new digital licences were placed amongst the existing analogue licences.

From August 2011 to September 2012 the Ministry led the restacking process for digital television licences. This involved moving the digital television services into the 510 – 686 MHz frequency range so that the 'digital dividend' spectrum (698 – 806 MHz) was clear of all digital television transmissions. Some further changes in the spectrum below 698 MHz will be required after television becomes completely digital after 30 November 2013.

From September 2012 through to November 2013, Digital Switch Over (DSO) is taking place, whereby legacy analogue television transmissions will be switched off.

Once all the analogue services have been switched off, there will be more clear spectrum (gaps) in the 510 - 698 MHz frequency range which could be used by radiomicrophones. Most of the major changes in the 510 – 686 MHz television frequency range are now complete. However, further changes may still be required from time to time. At this time most digital television licences are between 526 – 606 MHz but use could vary from area to area and will evolve with time, for example to accommodate new digital television services.

[1] LTE: long term evolution, a cellular technology specified by the Third Generation Partnership Project (3GPP) that provides high-speed data transfer.

Since the frequency range 518 – 582 MHz was provided for radiomicrophones (under GUSL licence number 222922) the lower limit frequency limit of the television band has been moved from 518 MHz down to 510 MHz. We propose a similar extension to the frequency range for radiomicrophones.

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

The licences for radiomicrophones cover only the spectrum owned by the Crown. Spectrum owned by the Māori Television Service is not and cannot be included in the licences issued by the Crown.

The amount of spectrum and its frequency range that is reserved for Māori television broadcasting is to change. The Māori Television Service (Te Aratuku Whakaata Irirangi Māori) Amendment Bill 2012 is currently before Parliament.

The Bill requires the Crown to transfer management rights for a 20 year period (from 1 December 2013 – 30 November 2033) over 16 MHz of UHF spectrum to Te Pūtahi Paoho for the establishment of a digital terrestrial television network. If the Bill is enacted the Ministry intends to use the frequency range 606 – 622 MHz (channels TV 38 and TV 39) to meet this requirement.

Radiomicrophones will not be able to operate within the frequency range of the resulting management right. This will mean that the 606 – 622 MHz sub-band will no longer be available to radiomicrophones. Notwithstanding that the Bill is not yet enacted, radiomicrophone use of channels TV39 must cease as soon as possible so implementation of the provisions can quickly follow enactment. (Use of TV38 by radiomicrophones is not permitted at present in any event).

The changes mean that the frequency range 582 – 606 MHz can be used by radiomicrophones after 30 November 2013.

6. Could Radiomicrophones use the APT guard bands?

The APT 700 MHz FDD band plan includes three guard bands. The purpose of these guard bands is to provide protection to and from the adjacent services and also allow enough frequency separation for the duplexers within the mobile device to operate satisfactorily. The guard band frequency ranges are:

- 698 – 703 MHz;
- 748 – 758 MHz; and
- 803 – 806 MHz.

The APT FDD band plan uses a conventional duplex where the 703 – 748 MHz range is used for uplink (mobile transmit) and the 758 – 803 MHz range is used for downlink (base transmit). This means that base station receivers will be operating in 703 – 748 MHz range and mobile receivers will be operating in 758 – 803 MHz range.

Long Term Evolution (LTE) is a cellular technology designed to operate in the APT band plan. LTE is a wideband technology and is likely to be deployed using transmissions with 5 MHz, 10 MHz, 15 MHz or 20 MHz bandwidths. These wider bandwidths also indicate the typical bandwidth over which the technology may be susceptible to interference from radio transmissions and devices operating in the adjacent bands. Also, because of their wide transmission bandwidths, they can cause degradation to services issues operating on frequencies somewhat separated from the actual transmissions.

Radiomicrophones operate on a secondary non-interference basis. Radiomicrophones must not cause interference to the licenced services in the digital dividend and must take care to ensure this does not occur.

6.1.1 Radiomicrophone operation in the 748 – 758 MHz or 803 – 806 MHz guard bands

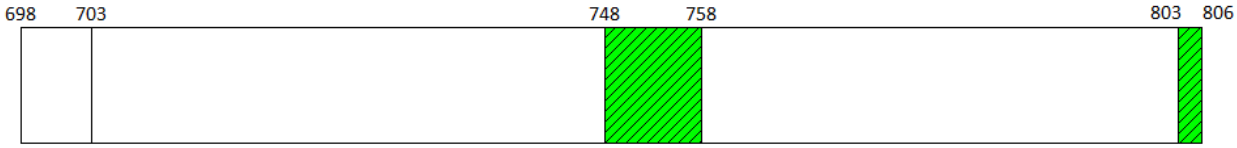

Figure 4: The centre guard band and upper guard band in the APT band plan

Our view at this stage is that it would be imprudent to use the centre guard band (748 – 758 MHz) or the upper guard band (803 – 806 MHz) for radiomicrophones. Radiomicrophones, even if operated at low power, could degrade or interfere with the receive function of cellular mobiles as it is likely that radio microphones will be operating in close proximity to cell phones. The Ministry is not proposing to licence radio microphone use in these frequencies.

6.1.2 Radiomicrophones operation in the 698 – 703 MHz band

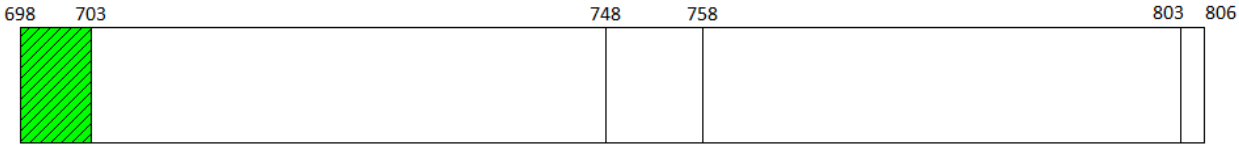

Figure 5: Illustrates the lower guard band in the APT band plan

Our view is that radiomicrophones should be able to operate in the lower guard band (698 – 703 MHz) of the APT band plan. If they are operated at a low power (-20dBW / 10mW) they should not cause significant issues for cellular base station receivers operating in the uplink band (703 – 748 MHz).

There is a possibility that radiomicrophones could experience degradation from cellular user equipment transmitting in the uplink band (703 – 748 MHz), particularly if radio microphones are operated close to the band edge (703 MHz). In the worst cases the effect of degradation could result in reduced operating range or non-operation of radiomicrophones. Radiomicrophones have no protection from interference under the licence in which they operate. However, the risk of degradation or interference could be managed by the radiomicrophone users.

The Ministry proposes that radiomicrophones be permitted to operate in the 698 – 703 MHz band at a maximum EIRP of –20 dBW (10mW) on a non-interference basis. The current conditional power limit of –3 dBW (500mW) would not be applicable to this small frequency range.

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?

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?

The Ministry will continue to watch international developments and studies to see if use of the mid band gap and upper guard bands by radio microphones is appropriate and if more liberal limits could be applied to the lower guard band.

7. Digital Radiomicrophones

Digital radiomicrophones provide many advantages over analogue, such as low noise, low distortion, encryption, better immunity from interference, better audio quality, enhanced transmission reliability, increased flexibility, and increased spectral efficiency.

Currently the radio microphone licences only provide for frequency modulated analogue devices though the permitted emission designator on the licence 300KF3EJN. The Ministry is interested in encouraging digital radio microphones and proposes to provide for them in any new or modified General User Spectrum Licenses. Digital radiomicrophones will not be provided for in the 703 – 806 MHz range as this frequency range is being phased out.

Question 4
Do you agree with allowing digital radio microphones? What types of emissions / modulation and emission bandwidths would be appropriate?

8. Standards applicable to Radiomicrophones

Radiomicrophones must meet a relevant performance standard listed in the 'Radiocommunications (Radio Standards) Notice 2010' (this can be found at www.rsm.govt.nz).

The standard listed in the notice relevant to radiomicrophones is:

- EN 300 422-1 V1.3.2 *"Electromagnetic compatibility and Radio spectrum Matters (ERM);Radio microphones in the 25 MHz to 3 GHz frequency range"*

Question 5
Are there any other performance standards that should be listed in the 'Radiocommunications (Radio Standards) Notice 2010'?

9. What is happening in Australia?

Australia has reassigned the 694-820[2] MHz television broadcasting band for new uses and has adopted the APT band plan. It has recently concluded its auction.

Australia is amending its Low Interference Potential Devices (LIPD) class licence[3] to do the following:

- permit the continued use of the 520 – 694 MHz frequency range for radiomicrophones;
- allow continued use of the 694 – 820 MHz band for radiomicrophones until 31 December 2014, after this date radiomicrophones will no longer be able to operate in this frequency range; and,
- allow digital radiomicrophones.

Australia has also made available part of a "centre band gap" in the 1800 MHz cellular spectrum (1790 – 1800 MHz) for radio microphone operation. This is a little narrower that the overall gap between the two frequency bands used for mobile services (1785 – 1805 MHz), presumably to provide a greater probability of satisfactory technical co-existence between these two services. Australia require equipment in their class licence to conform to ETSI standards EN 301 840 or EN 300 422. In New Zealand the overall spectrum from 1710 MHz to 1890 MHz has been allocated as management rights to private owners. The Ministry therefore cannot authorise radiomicrophone usage in these frequencies.

[2] The Australian television plan is different from New Zealand's. Before decisions on the digital dividend, Australia had an upper frequency limit of 820 MHz while New Zealand had a limit of 806 MHz.
[3] Australia's 'Class Licence' is similar to New Zealand's General User Radio Licence or General User Spectrum Licence.

10. Summary of proposed changes

The current and proposed future spectrum provisions for radiomicrophones in the UHF band are shown in Figure 5 below. The changes are:

1) Allow radiomicrophone use of the 703 – 806 MHz band to continue until 11 March 2015, permitted as an incumbent General User Spectrum Licence within the digital dividend spectrum to be sold. After the expiry of the licence on 11 March 2015, radiomicrophones will no longer be able to operate in the 703 – 806 MHz frequency range.

2) Allow use of radiomicrophones at a maximum EIRP of -20 dBW (10 mW) in the lower APT guard band 698 – 703 MHz;

3) Allow the frequency range 510 – 606 MHz to be used, providing an additional 32 MHz for radiomicrophone use on the current frequency range of 518 – 582 MHz. This can be provided after digital switch over (30 November 2013);

4) Disallow the use of the 614 – 622 MHz sub-band. This is to allow for the outcomes proposed in the Māori Television Service (Te Aratuku Whakaata Irirangi Māori) Amendment Bill 2012; and

5) Provide for digital radio microphones in any new or amended General User Spectrum Licences. Note that digital radiomicrophones will not be provided for in the 703 – 806 MHz range.

Before 2009, radiomicrophones had160 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.

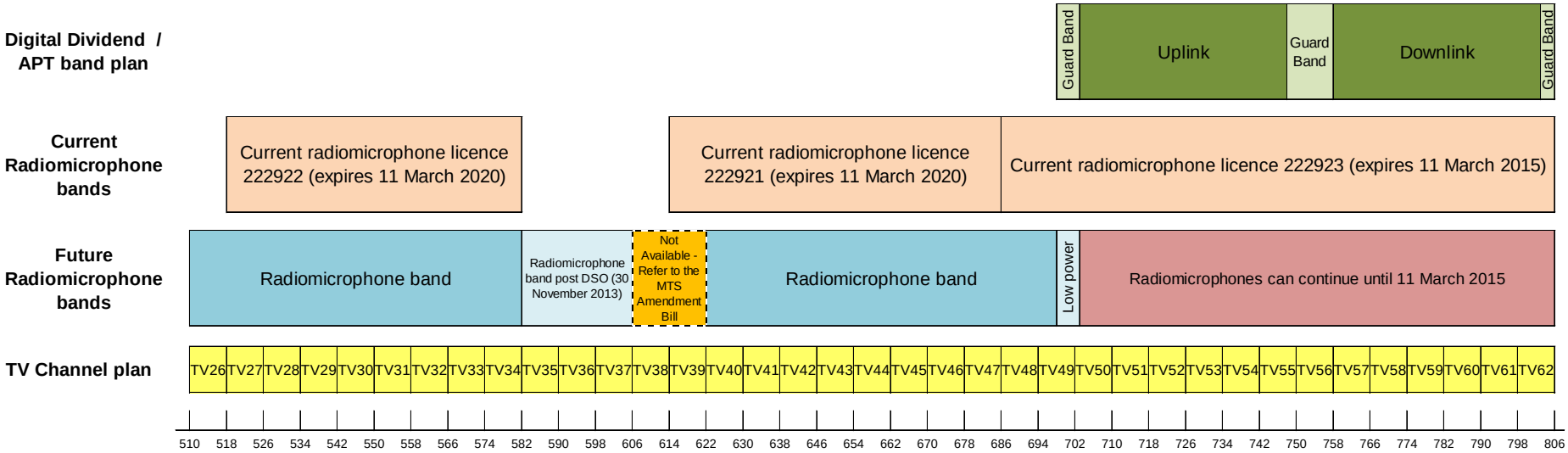

Figure 5: Overview of the 510 – 806 MHz band showing the changes for radio microphone