27 May 2016

Radio Spectrum Band III Consultation
Radio Spectrum Management Policy and Planning
Ministry of Business, Innovation and Employment
PO Box 2847
WELLINGTON 6140

By email to Radio.Spectrum@mbie.govt.nz

Dear RSM,

Consultation Document: Options for 174 – 230 MHz – 4RF Comments

Thank you for the opportunity to participate in the Options for 174 – 230 MHz: Consultation Document 'Review of options for allocating spectrum in VHF Band III' process.

Introduction

4RF Limited has specialized in the design, development, and manufacture of digital radio product including point-to-point microwave and point-to-multipoint SCADA data radios for 15 years. Our systems operate in licensed spectrum bands that extend from 135 MHz to 3 GHz and are used in more than 140 countries. We not only manufacture equipment but we also engineer, license, and install links for many customers in many of those countries. This activity has given us a unique perspective on the deployment of radio systems and practical regulatory considerations.

As a supplier, 4RF has a vested interest in the availability of adequate spectrum for our products but we sincerely believe that economic and security benefits will accrue to all New Zealand from services that result from the proper allocation and utilization of spectrum. Based on our worldwide experience we advocate a carefully balanced approach to spectrum allocation, recognising the needs of critical infrastructure, public safety, corporate enterprise, and recreational users. The digital dividend has naturally resulted in a popular focus on 700 MHz but, as RSM and industry has recognised, there is now the opportunity to redeploy other dividend spectrum such as Band III.

The US and Canada have the band 216 to 222 MHz available for commercial and government users with channels arrangements in place to permit 12.5, 25, and 50 kHz operation. The wide 50 kHz channels are particularly interesting as these allow low capacity digital SCADA systems to offer rates of more than 200 kbps. 4RF is producing a 220 MHz version of our point-to-multipoint Aprisa SR+ digital telemetry radio for the SCADA/IIoT (industrial internet of things) market and we deliver 60 kbps in 12.5 kHz, 120 kbps in 25 kHz and 215 kbps in 50 kHz with our ETSI compliant product versions.

4RF has worked with RFUANZ, advocated to critical infrastructure users, and more generally promoted the advantages of Band III in New Zealand for more than two years. We believe that this band will be ideal for use in this country, combining good distance capability similar to VHF but with smaller antennas sizes. RSM was kind enough to permit 4RF to conduct tests on two frequencies within Band III and these confirm our view of the applicability of the propagation to New Zealand conditions.

Other Applications

We acknowledge the utility of the band for applications beyond telemetry, SCADA, and the IIoT. Even with the migration to 12.5 kHz operation, LMR (land mobile radio) users still see the need for additional LMR spectrum. We also recognise the traditional utility of Band III for broadcasting and DAB (digital audio broadcasting) in particular.

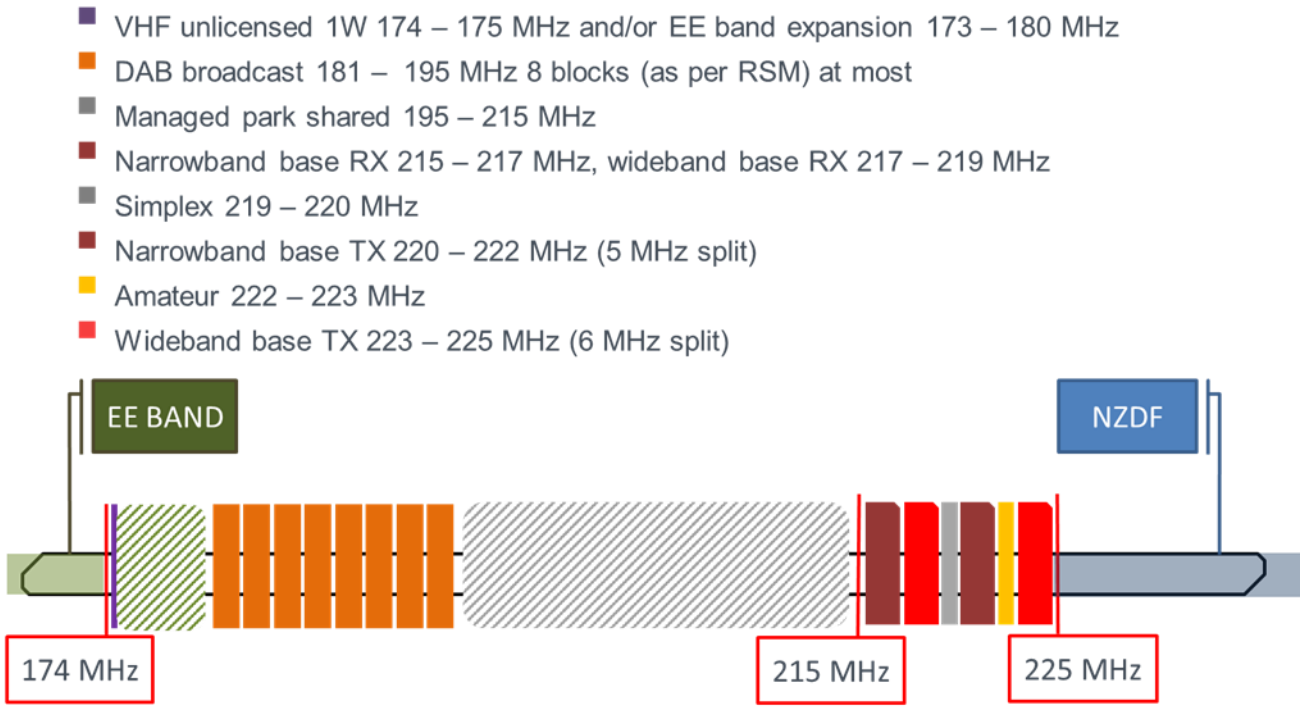
4RF Limited, 26 Glover Street, Ngauranga, Wellington 6035, New Zealand
Tel + 64 4 499 6000 Fax + 64 4 473 4447 Email 4rf@4rf.com

While the present New Zealand 'trial' DAB systems have been operating for many years we understand that their main utility is as fixed links to feed programme sound to other transmitter sites. Nevertheless, we see no reason why a limited DAB allocation as proposed by RSM would not provide enough space for the very small number of users that actually have or would be expected to purchase capable receiving equipment. As time passes standards change and the more advanced DAB+ technology has emerged. In contrast we note growing interest in digital radio operation within the existing 88 to 108 MHz FM band using IBOC HD or DRM+ technology. It is understood that the RBA (Radio Broadcasters Association) initiated a trial of IBOC technology in December 2006. Despite years of discussion it is ironic that the most widely available and listened to digital radio programme transmission presently available is actually the Freeview Terrestrial DVB-T multiplex on UHF (RNZ National, RNZ Concert, and BaseFM).

Finally, 4RF believes that an amateur allocation similar to that of North America would benefit the New Zealand radio industry. Given the positive US history, clearly commercial and amateur use is not mutually exclusive. Our industry needs as many radio engineers as possible and amateur radio is one way of helping young people develop an interest radio technology.

4RF Response to Consultation Document Questions

We propose the band arrangement as shown in **Figure 1** below for discussion:



Radio microphones

Q1. Should spectrum in Band III be allocated for radio microphones? If so, how much spectrum would satisfy demand in this area?

We note that there is the UK license exempt frequency allocation used for wireless microphones and aids for the deaf in the range 173.8 – 175 MHz. A parallel allocation in New Zealand may be of value and there are also other calls for VHF license exempts services. Perhaps a low power LPID EIRP limited GURL could be considered in this range. We do not support the wholesale use of 174 to 223 MHz for radio microphones as appears to be permitted in parts of the EU.

DAB

Q2. Should spectrum in Band III be allocated for DAB? If yes, why? If not, why not?

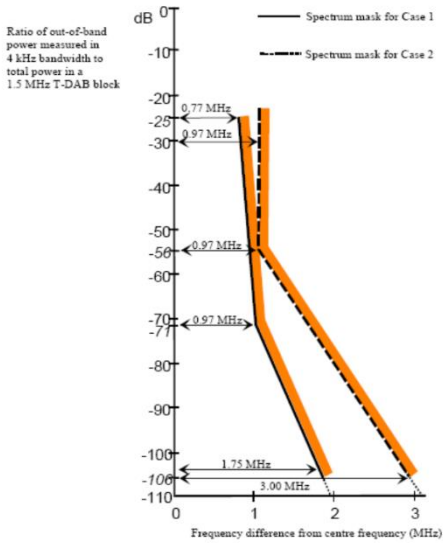
4RF is sceptical that a new, complex, and special-to-type consumer broadcast service can be launched in New Zealand given the ubiquity and general purpose nature of the medium that is the Internet. On the other hand, it has proven to be a mistake to allocate spectrum in such a way as to ignore ITU recommendations and *de facto* uses.

Q3. Would an allocation of 14 MHz in the form of eight 1.536 MHz frequency blocks be an appropriate spectrum allocation for DAB in New Zealand? If not, how many multiplexes would be more appropriate for current demand?

It is difficult to judge future demand. We note that the UK has 12 T-DAB blocks in use for population of 64 million so it would appear that New Zealand could be served with the proposed eight blocks.

We note the ERO report on the utilisation of MA02revCO07 spectrum masks (FM50_12_038_Sweden_The use of MA02revCO07 spectrum masks for non T-DAB applications). Broadcast DAB operation occurs at very high EIRP levels; the existing two carriers are of Licence Type VHF FM >=30 & <40dBW. With such power levels generous guard bands and close attention to out of band transmitter emissions are required. The allocation of DAB blocks should not be such that adjoining spectrum is sterilised from practical use. The ERO report recommends a sensitive case mask to apply to T-DAB transmitters operating in areas where it is critical to protect other services (non-DAB) operating on adjacent frequencies (**Figure 2** below).

It is entirely possible that this spectrum may at some future date morph into some new unforeseen high power broadcast service so retaining an allocation even if lightly used seems entirely reasonable. Interestingly the ERO report mentions HSPA and LTE.



LMR

Q4. Should spectrum in Band III be allocated to LMR? If yes, how much spectrum would satisfy demand in this area?

Spectrum in Band III will be useful for land mobile. Even with the industry migration to 12.5 kHz operation, LMR (land mobile radio) users still see the need for additional LMR spectrum. Two distinct use cases exist, an extension of the EE band and an altogether new 220 MHz allocation. In the case of an EE band extension, we propose the EE band be expanded to 180 MHz (with or without the inclusion of a license exempt allocation as discussed in our response to Question 1). However, we do not believe that the proposed extension of EE band (and the implicit channelisation rules) provides adequate accommodation for telemetry, SCADA, and IIoT needs nor does it address the strong demand for wider channels to properly support current migration of existing serial SCADA networks to IP operation.

We believe that this demand for faster SCADA network speeds by companies involved in the utility space can be met by 50 kHz channels. For these needs we propose a new 215 to 225 MHz allocation arrangement as shown in **Figure 3**:

Narrowband 215 – 217 paired with 220 – 222 MHz 5 MHz split 12.5/25 kHz channels

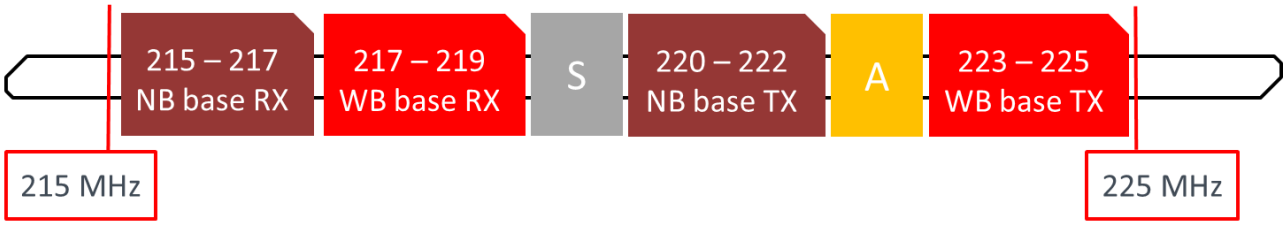
Wideband 217 – 219 paired with 223 – 225 MHz 6 MHz split 50 kHz channels

- Either split generous for duplexer designs, the wider split slightly favours wideband services where notch designs less suitable

Simplex 219 – 220 MHz 12.5/25/50 kHz channels

Amateur 222 – 223 MHz to align with ITU Region 2, notably USA

- Good 'neighbour' EIRP limit to same as other 215 to 225 MHz services



Where narrowband channels would permit both voice LMR as well as machine to machine communications and wideband channels would permit high capacity digital SCADA and telemetry radio systems. Such an allocation may well see migration of existing SCADA systems from other VHF/UHF LMR bands, reducing pressure on those bands.

Q5. If spectrum is allocated to LMR, should there be technological requirements around the use of this spectrum? If yes, why? If not, why not?

In the case of an extension of the EE band we propose the rules be the same as the existing EE band rules. In the 220 MHz proposal contained in Figure 3 above, we have used the technology neutral terms narrowband and wideband to avoid a technology specific lock-in as we believe this is counter to the more desirable dynamic of the market selecting the most appropriate solutions.

4RF Limited, 26 Glover Street, Ngauranga, Wellington 6035, New Zealand
Tel + 64 4 499 6000 Fax + 64 4 473 4447 Email 4rf@4rf.com

Q6. If spectrum is allocated to LMR, is it appropriate to charge a fee for this use or transfer the spectrum to the management rights regime? If yes, why? If not, why not?

We do not support a management rights regime for LMR channels as this approach largely prevents users from implementing their own individual operational requirements to address coverage, security, and resilience concerns. An individual license approach allows end users to make their own investment decisions based on these considerations.

Implementation of a management rights regime usually leads to dominance by a small number of players with interests not always aligned to small, but still important, users such as critical infrastructure. For example, it is not often well understood why utilities are not well served by public cellular network providers. While these public systems might superficially seem suitable, issues of reliability, quality of service, and lack of service priority alignment make them unpopular with utilities. This is more than institutional bias; it is the result of simple economics. Cellular companies are not in the business of considering the priorities of a few thousand critical infrastructure points ahead of 3 millions of consumers. Similarly, these networks are not designed to operate under extended power outages and natural disasters. In New Zealand many cell sites have just a few hours of battery backup and in some cases no back up at all. Low cost cell site tubular support structures buckled and failed in Christchurch due to horizontal motion during the 2011 earthquake.

Q7. Is there a demand for exclusive spectrum in Band III, either now or in the future, for IoT technologies? If yes, which IoT technologies are demanding this spectrum?

We believe that low capacity industrial IoT systems would be well served by the 220 MHz Figure 3 allocations proposed by 4RF. It would seem that consumer IoT networks will use public cellular networks.

Q8. If spectrum is allocated to IoT, how much spectrum would satisfy demand in this area?

Because demand is difficult to foresee our proposal (see Figure 1) includes a managed park ‘sandpit’ shared 195 – 215 MHz allocation that could support wideband IoT needs and other potential uses.

Q9. Which type of licensing framework is most appropriate for spectrum allocated to IoT?

Low capacity industrial IoT systems should be accommodated within the traditional apparatus licensing system. High capacity IoT systems that could be a use of the proposed managed park can be accommodated under existing spectrum park rules modified as necessary to prevent dominate monopoly use.

Q11. Is there demand for NZDF use of spectrum between 225–230 MHz?

Q12. Should spectrum in Band III be allocated to NZDF? If yes, why? If not, why not?

4RF believes that it is right and proper that NZDF regain full access to the entire 225 to 400 MHz NATO harmonised Band I allocation given the demands of today’s electronic battlefield and the critical needs for interoperability. We live in a world of growing uncertainty.

Q13. Should New Zealand consider PPDR uses in Band III? If yes, why? If not, why not?

Q14. If there is demand for PPDR in Band III, how much spectrum would satisfy this demand?

Because demand is difficult to foresee our proposal includes a managed park that could be used for PPDR needs.

Q15. Are there any other uses of Band III that should be considered? If yes, please describe.

As noted in our introduction 4RF believes that an amateur allocation similar to that of North America would benefit the New Zealand radio industry. Given the positive US history, clearly commercial and amateur use is not mutually exclusive. Our industry needs as many radio engineers as possible and amateur radio is one way of helping develop radio technology interest. We propose an Amateur 222 – 223 MHz allocation to align with ITU Region 2, notably the USA.

4RF Limited, 26 Glover Street, Ngauranga, Wellington 6035, New Zealand
Tel + 64 4 499 6000 Fax + 64 4 473 4447 Email 4rf@4rf.com

In closing 4RF believes that Band III is an excellent opportunity to address growing needs and relieve pressure on spectrum in a number of areas.

Attached is a PowerPoint presentation given to various industry groups on the potential use of the band.

Yours faithfully

John Yaldwyn
Chief Technology Officer
Director Regulatory Affairs

4RF Limited, 26 Glover Street, Ngauranga, Wellington 6035, New Zealand
Tel + 64 4 499 6000 Fax + 64 4 473 4447 Email 4rf@4rf.com