

1 Background

This is a response from Rodgers Hulston and White Limited (RHW) to the discussion document, "Fixed Services in New Zealand Discussion Document: Ensuring efficiency in the backbone of the digital economy (January 2015)" released for comment by the Radio Spectrum Management group of the Ministry of Business Innovation & Employment.

Rodgers Hulston & White Ltd (RHW) specialises in the design of communication systems for private networks in particular utilities and government departments.

The two company directors, Garry Rodgers and Graham Hulston, have between them 60 years experience in designing and implementing radio networks from HF to Microwave Frequencies. Both are Approved Radio Engineers (ARE) as approved by the Ministry of Development (Radio Spectrum Management Group).

Our services include but are not limited to:

- Checking suitability of existing infrastructure indoor and outdoor for radio systems.
- Checking line of sight at new or existing sites.
- Identifying options for new radio networks or upgrades to existing networks.
- Point to Point, Point to Multipoint, and Mobile radio design using Pathloss and other software tools.
- Assessment of interference and recommending suitable frequency bands and channels.
- Licensing of Radio Links and interference investigations.
- Troubleshooting of existing links.
- Evaluating and recommending equipment for radio links.
- Electromagnetic Radiation compliance statements for resource consent.
- Radio training courses for technicians and engineers

Our Clients have included: Transpower, Meridian, Trustpower, Energy³, TelstraClear, Telecom, Kordia, Vodafone NZ and Fiji, Watercare Services Limited, Maritime NZ, Department of Conservation, National Bank, and NZ Police.

It is with this experience and knowledge that we offer in the following sections our comments and answers (in blue italics) to the questions listed in the above mentioned discussion document.

2 GENERAL FIXED SERVICE PROPOSALS

2.1 Digitisation

1. Should all or some sub 1 GHz fixed service bands be digital only? If so, are there particular bands that should be given priority to change to digital only services?

See reply below in 2.

2. Should any requirement for digital services apply to new licences only or should existing analogue services be required to transition to digital? If all licences are required to transition to digital services, over what time period should analogue licences be phased out?

To make efficient use of the spectrum RHW supports making channel bandwidths greater than 12.5kHz only available for digital.

Also given the inefficient use of spectrum by analogue STL links which occupy relative large channel bandwidths RHW believes that RSM needs to initiate a transition to digital

particularly in I and JL bands for STL links to free up spectrum. For other uses of this spectrum the natural migration from analogue to digital links will continue as the services that they support move from analogue to digital however it seems for broadcasters there is no business imperatives or commercial pressure to move from analogue to digital.

2.2 Spectral efficiency

- Should the Ministry increase the minimum spectral efficiency of digital services from one bit to four bits per second per Hertz? If so, should this apply to some (please identify which ones) or all bands?

For Channel Bandwidths >1MHz and in the Microwave Bands (>3GHz).

The minimum requirement of 4 bit/s per Hertz should apply only to 28, 29.65, 40, and 56MHz channels which should be reserved for high capacity linking only >140Mbit/s. For 14MHz channels a minimum requirement of 2bit/s per Hertz should apply. For channel bandwidths less than this the minimum requirement of 1bit/s per Hertz should remain.

RHW is aware of number of radio links using bandwidths 28MHz or greater where only 16QAM is being used. This does not represent optimum use of the spectrum.

For Channel Bandwidths <1MHz and in the VHF and UHF Bands (30MHz-3GHz) the following should apply:

<i>Channel Bandwidth</i>	<i>Spectral Efficiency (bit/s per Hertz)</i>
<i>≤25kHz</i>	<i>1</i>
<i>≤100kHz</i>	<i>2</i>
<i>>100kHz</i>	<i>4</i>

- Should any requirement for increased spectral efficiency apply to new licences only or should existing licences be required to transition to this standard? If so, over what time period should the lower standard be phased out?

Increased spectral efficiency should only apply to new licences. The issue of transition needs to be discussed on a band by band basis looking first at those that are congested in DMAs.

2.3 Metropolitan site congestion

- Should further areas be added to the designated DMAs and if so which areas?
No not in the experience of RHW.
- Should further DMA rules be introduced? If so, what should the rules specify? Should these be tailored to each particular DMA?

For these major hubs minimum path lengths should apply for each band giving regard to rain rates in these areas for bands 8GHz and higher. Also for each site and band a minimum frequency reuse angle should be set based on EIRP, antenna RPE, and the arc subtended at the radio site that contains the majority of current and potential radio links terminating on the site.

- Should any DMA specific rules be applied to new licences only or also apply to existing licences? If existing licences become subject to the new rules, how should the transition be managed?

The rules should only apply to new licences. However, if an existing licence is preventing the creation of new licence that would have been certified had the existing licence complied with the new rules. Then there should be some obligation on the current user to remedy the situation even if it is at the new user's expense.

2.4 Interference evaluation method for Digital Microwave Radio (DMR)

8. Should the current '1 dB interference threshold degradation' method prescribed in Section 4.3 'Co-channel interference threshold' of P/B 38 be retained or replaced with a carrier to interference method? Please provide information on why the method should be changed and the increased spectral efficiency over the current 1dB threshold degradation method expected to result from the change.

The 1dB degradation method should be retained as it is in general difficult to get C/I information for radio equipment. Also the 1dB method tends to give a conservative estimate of interference which provides a margin for uncertainty in equipment performance. However in the case where the significant interference is intra client (i.e. interference between links of the same client) it should be possible to certify on the basis of the Carrier to Interference method.

9. If the method is changed to a carrier to interference method, how should this be implemented?

Acceptance of the C/I approach should be based on the approval of the client. This should be included in the conditions associated with the licences for the victim receivers.

2.5 Adjacent channel interference criteria

10. Are the Frequency Dependent Rejection values in P/B 38 appropriate? If not, what should these values be? Should there be different values for different bands?

In general these values less than be achieved given the performance of the modern radio equipment but in the absence of the relevant data for a radio they do provide a conservative estimate of interference which is preferred.

If an interference problem is found post installation of link it is in general expensive to find and fix and therefore RHW tends to support a more conservative approach to the calculation of interference.

2.6 Equipment standards

11. Should the Ministry implement equipment standards for fixed services above 1GHz? If so, what standard should be specified?

RHW in general supports the addition of more specific requirements in the general licence conditions if it reduces the need for interpretation. RHW supports the adoption of the international standard such as EN 302 217-2 as way of managing the concern regarding equipment performance particularly as microwave links are now seen as a 'commodity' in a price sensitive market.

2.7 Necessary bandwidth and channel widths for digital services

12. Should the Ministry adjust the general licencing conditions for digital services to ensure licences better reflect occupied bandwidth in the microwave bands?

Yes RHW supports the including ITU-R F.1191 compliance in the general licencing conditions.

Also RSM should provide more guidance to AREs and ARCs regarding the implications of the general conditions. For example the significant of 99% power bandwidth with respect to

emission designations and the requirement for occupied bandwidth to be less than or equal to the channel bandwidth.

2.8 Information on licence records

13. Is inaccurate information on licences a significant issue for AREs and ARCS and licensees? If so, how should the Ministry respond to the issue?

Only significant issue is the accuracy of site coordinates.

2.9 Transition of spectrum to the management rights regime

14. Should the Crown consider creating management rights for bands where there is predominantly a single licensee? If so, are there other criteria that should be met before a management right is created for fixed service bands?

RHW believes that creating MRs for linking bands would be unhelpful, reducing the potential use of a band and inappropriate given that the frequencies and directional antennas used in the microwave bands permit much more frequency reuse than is possible with point to area coverage applications under the MR regime e.g. cellular.

15. If spectrum is transferred into the management rights regime, should it be managed by the Crown or allocated to a private manager? If allocated to a private manager, should the allocation be by contestable means or to the predominant user?

No comment.

2.10 Channel widths

16. Should the Ministry apply consistent channel sizes across specified frequency ranges in fixed service bands? If so, what should be the basis for these channel sizes? Should channel sizes be based on the preferred channel width shown in Table 3?

Yes RHW in general supports those shown in Table 3 except for the 800MHz to 1GHz range where the channels should be in multiples of 50kHz instead of 250kHz with a maximum bandwidth of 250kHz. This should be considered as part of policy for getting STLs to migrate from analogue to digital.

2.11 Band renaming

17. Should the Ministry rename bands that are currently prefixed with letters, by numbers representing their approximate frequency of operation?

Yes the bands should be renamed to reflect the operating frequency band this would align with what is used internationally and by manufacturers in general. It also avoids confusing the bands with the letter designation used for Radar and Satellite bands.

3 BAND SPECIFIC PROPOSALS

3.1 Istl, JKstl, KL and K STL bands

18. Should digital services be permitted in STL bands? If so, should digital and analogue services be permitted or should all existing analogue services be required to transition to digital?

Agree.

19. Should a minimum link distance be specified for STLs in some bands for current and/or future links? If so, which bands should have the minimum link distance specified?

For the UHF bands rather than specifying a minimum distance, a maximum receive level should be specified as STLs tend to converge on common hub sites within a given metropolitan area.

20. Should no new dual mono STL services be allowed? If not, should the Ministry transition users from dual mono services to digital links?

Agree

21. If the Ministry allows digital licences in the STL bands, should any broadcaster that transmits more than 3 programmes between a studio and broadcasting site be required to use a 500 kHz channel digital STL and those broadcasting a single programme be required to use a 250 kHz channel digital STL?

Maximum bandwidth for STLs should be 250kHz.

22. Should a limit of three STL licences (via a combination of analogue and digital transmissions) at any single location be introduced for any single licensee? If so, should this be limited to congested sites only? If so, which ones? Should these limits apply retrospectively to current licences or should they only apply for new licences. Should the limits apply once any licence holder applies to make a change to any one licence at a site?

No comment

23. How should the Ministry manage the timing and introduction of any changes to STL services? How should each of the five proposals above be managed?

No comment

3.2 EE Band

24. Are there any issues with the current band plan, use of, or future demands for the EEband?

No

3.3 I Band

25. Should the Ministry offer 100 kHz channels in the / band (Group G) which interleave with the current 50 kHz channel plan? If not, how should the channel plan be amended, if at all?

Yes

3.4 J Band

26. Should the Ministry offer 100 kHz channels in the J band (Group D) which interleave with the current 50 kHz channel plan? If not, how should the channel plan be amended, if at all?

Yes

3.5 JL band

27. Are there any issues with the current band plan, use of, or future demands for the JLband?

No

3.6 KK Band

28. Are there any issues with the current band plan, use of, or future demands for the KK band?

Yes the current 500kHz channels are wasteful given the high modulation currently available i.e. 16 to 64QAM and therefore RSM should consider reducing the channel size to 250kHz.

3.7 L Band

29. What services should L band be used for in the future? Why?

This band is the only licenced band available for high data rate point to multipoint services relative to that available at 400MHz. In the past the use of this band by other parties has been frustrated by the dominance of Telecom/Spark/Chorus. RHW when providing consultancy for SCADA links have identified this band as potentially useful for higher throughput SCADA networks as alternative to using 2.4GHz ISM with the high risk of interference.

3.8 5 GHz Band

30. Are there any issues with the current band plan, use of, or future demands for the 5GHz band?

No

3.9 P Band

31. Do you have comments on the current coordination process or possible future demands for services in the P band?

This band has been under-utilised for terrestrial linking within the NZ as it historically has been used where the higher frequency bands (particularly T Band) were not available for long haul high capacity links. At present there are no terrestrial licences in P Band and therefore by default C band downlink links are the primary user of this band.

3.10 R Band

32. Should the Ministry adopt 28 MHz channelling for the R band?

Yes

33. If the Ministry is to adopt 28 MHz channelling, should this be applied to new licences only or should all existing licences be required to transition to the new channelling? How long a timeframe should be allowed for the transition?

RHW supports this applying to new licences but transitioning of existing licences to the new channels presents technical problems for N+1 radio systems which are in generally not agile in terms of modulation and bandwidth. Also N+1 systems use channel specific branching filters that would need to be retuned which is difficult to do in-service.

3.11 T Band

34. Is the N+1 designation still required for efficient use of T band?

No

35. Should the redundant TA channels be removed from the channel plan for the Tband?

Yes they were only useful when analogue radio was used for long haul trunking.

36. Should the Ministry consider rechanneling the T band to 14 MHz channel widths? If not, why not?

No.

The 40MHz channel spacing should remain as this band is the most optimum for high capacity long haul radio in NZ. It is high enough in frequency to provide good antenna gains and space diversity improvement with reasonable spacing's and low enough in frequency that rain outage is negligible. Also a 40MHz channel allows 64QAM to be used

which has a higher system gain (typically 4-6dB) than 128QAM which needs a 28MHz channel for high capacity links.

3.12 V Band

37. Should new 56 MHz channels V23A (7110.5 MHz) and V23A# (7341.5 MHz) be created? If so, could the new 56 MHz channels coexist with the TVOB channels currently in place? What would be an acceptable coordination policy if this were to occur? Should the new 56 MHz channels be available only on a non-interference basis?

No comment

38. Can existing demand for the TVOB channels in V band be accommodated on other TV OB channels?

No comment

3.13 U, W and Y bands

39. Do you have comments on the current coordination process or possible future demands for services in the U band?

No

40. Should W band be rechanneled to enable either 28 MHz, 40 MHz, or 56 MHz channelling to enable new services? Which channel size is preferred? Why?

RHW supports rechanneling to 28MHz as another channel in this band is gained whereas either 2 or 4 channels would be lost respectively if 40MHz or 56MHz were used in what is a busy band. RHW would support the creating of 56MHz in addition to 28MHz channels.

41. Should the Yx channels be disestablished from the V band channel plan, enabling the current dominant channel plan (YxA) to become the single channel plan for V band?

Yes

42. Should the Y band have an additional 56 MHz allocation added to the current YxA 28 MHz channel plan?

No doesn't seem worthwhile for only one channel.

43. Should the band boundaries be realigned to match ITU-R F.386, by adjusting the U/W boundary at 7.730 GHz down to 7.725 GHz, and by adjusting the W/Y boundary from 8.290 GHz to 8.275 GHz?

Yes if rechanneling of W band happens.

3.14 H band

44. Should the Ministry offer a 14 MHz channel plan for H band and migrate users away from 21 MHz channelling?

Yes

45. Should the band be reallocated to a different service or use? If so, what other services or uses should be allocated to the H band?

No

3.15 Z band

46. Should the Z band channel plan be changed to 28 MHz channels? If not, why not?

No, the existing 40MHz should be retained to permit the use of 64QAM for high capacity. The 4-6dB system gain advantage over 128QAM allows this band to bridge the distance gap between 5 and 20km for minimum path length. Without the use of 64QAM it is likely that, as in the past for analogue, Y band or lower frequencies will have to be increasingly used for sub 20km high capacity paths.

47. If a 28 MHz channel is adopted, should the Ministry also adopt a 56 MHz channel plan?

See comment above.

48. If the band is rechanneled, should incumbent licensees be required to transition to the new band plan?

See comment above.

3.16 3.16. G band

49. Are there any issues with the current band plan, use of, or future demands for the G band?

No

3.17 X band

50. Should the Ministry introduce an additional 56 MHz channel to the X band, or should it remain unavailable for assignment?

No comment

3.18 18 and 23GHz bands

51. Should the Ministry facilitate in any specific way the development of satellite services in the Ka band? For example, should the Ministry consider early clearances of some fixed services in either the 18 or 23 GHz bands?

RHW has recently within the last two year engineered SES wideband licences for Ka Band. Although some potential interference cases were identified from Terrestrial links they did not cause a problem due to the use of a large SES antenna (13m). However this is not expected to be the case for VSAT services where smaller antennas are used. At present the uptake for these services in NZ is low and hence early clearance of fixed services is probably not justified.

52. Should the Ministry remove the underutilised 3.5 and 7MHz channels from the 23 GHz channel plan?

No comment

3.19 38 GHz band

53. Are there any issues with the current band plan, use of, or future demands for the 38 GHz band?

No

3.20 70-80GHz band

54. Should the Ministry move the licencing regime for the 70-80 GHz band from administrative licencing to a New Zealand general user radio licence?

No, at least not initially. RHW supports the approach adopted by OFCOM of splitting the band into two halves; one half covered by a general licence and the other by individual licences. If this is implemented then the decision should be reviewed e.g. in 5 years' time



to see how things have changed. If the take up of licences is still low then RHW supports moving to a general licencing regime for the whole band.