174 to 184 MHz LMR Questions

2 Allocation design

Q1. Should any other objectives apply to the allocation of 174 MHz to 184 MHz for LMR services?

No

2.1 Licensing regime

Q2. Do you have any comments on the proposal to manage 174 - 184 MHz under the management rights regime?

The Management right allocation model is inefficient way to manage spectrum particular when there is demand from many small users of spectrum which is the case for Land Mobile. A good example of an inefficient use of spectrum is the 3.5GHz MR. RHW has received enquiries from potential users of this spectrum who were put off by having to negotiate with MR holders to secure spectrum licences. As a consequence this spectrum has been underutilised.

Therefore RHW would prefer the new spectrum being under the radio licence regime.

Q3. Do you agree that a resource charge (set through the sale price) be applied to spectrum rights in the LMR frequencies between 174 MHz to 184 MHz? If not, how should the Ministry manage demand for spectrum?

No.

2.2 Channel Plan

Q4. Do you agree that 6.25 kHz is an appropriate channel bandwidth as the basic building block for the channel plan in 174-184 MHz?

See comment below under Q9.

Q5. Do you agree the maximum channel width should be 12.5 kHz for voice services?

Yes but the band should be restricted to digital LMR only.

Q6. Do you agree that 4.6 MHz is an appropriate duplexer spacing for this band?

Yes

Q7. What should be the balance between simplex and duplex channels? Should more simplex channels be provided for?

There should more duplex than simplex channels since the most likely use of this band is for repeater sites. RHW supports only 1MHz being allocated to simplex which leaves 3.7MHz for duplex channels (296 12.5kHz channels)

Q8. Should the duplex repeater base transmit channels be in the upper or lower portion of the band?

When considering the use of EE and the new band on the same repeater site then the duplex repeater base transmit channel must be in the higher portion of the band. This ensures maximum frequency separation between transmitters and receivers on site and minimises the amount of filtering required to manage blocking and transmitter wideband noise

Q9. Should the different channel sizes be interleaved in the channel plan or grouped according to size?

The 6.25kHz channel bandwidth can only be used for digital services based on dPMR / NXDN / NexEdge. Though very efficient when a single voice channel is required there are significant disadvantages when deploying multi-channel trunking systems when compared with DMR. There are also many examples with the current interleaved plan used for other bands where use of a 6.25kHz channel has prevented the use of the overlapping 12.5kHz channel. Therefore I support the use of blocks grouped according to size with a 50/50 split of the band between the two channel widths.

Q10. Do you have any other comments on the configuration of duplex and simplex channels?

No

2.3 National or regional allocations

Q11. Would you or your organisation be interested in purchasing management rights (nationwide access) in 174 MHz to 184 MHz? If so, would this be for duplex channels, simplex channels or both?

No

Q12. Do you have any comments on whether simplex licences should be issued on a shared use basis or for exclusive use in the coverage area?

Shared use basis only.

Q13. Do you have any comments on whether the duplex channels should be offered as paired rights or as 'single channel' rights?

Duplex channels must be offered only as a 'paired' rights, 'single channel' rights do not make any practical sense.

2.4 Use Restrictions

Q14. Do you have any comments on what services should be allowed in 174 MHz to 184 MHz and how management rights could be configured for these services?

Band should be restricted to digital LMR only.

Q15. What, if any, maximum channel width should be set for the different duplex and simplex services? Please provide reasons for why you propose any particular maximum.

Maximum should be 12.5kHz.

Q16. Should some fixed to multipoint services be permitted in 174 MHz to 184 MHz? If so, what types of service and what other restrictions, if any, should be applied to these services?

Currently PTMP services (Telemetry) are being provided in LMR bands using standard repeater licences. This works for most users so I cannot see any need to provide any special provision for fixed to multipoint services. There is however a need to PMP for SCADA applications which higher data rates and greater availability than can be provided using LMR. This is best meet by creating a dedicated band for this purpose in the range from 174 to 230MHz. This band could also be used for PTP links.

Q17. Should mesh networks be permitted in 174 MHz to 184 MHz?

Definitely not for duplex frequencies as this would be incompatible with the licence planning rules given in PIB 38 and PIB 58 for landmobile repeaters. It could be accommodated using simplex frequencies assuming they allocated on a shared basis.

2.5 Term of Management Rights

Q18. What term is appropriate for the LMR management rights between 174 MHz to 184 MHz?

Do not support a MR regime for these frequencies.

2.6 Allocation Mechanism

2.6.2 Allocating Crown Spectrum Licenses

Q19. Do you have any comments on the proposed allocation method for management rights and/or spectrum licences?

No comment

2.7 Pricing and payment terms

2.7.1 Management Rights

Q20. Do you have any comments on how the reserve price for a management right should be set?

No comment

Q21. Do you have any comments on payment terms for management rights?

No comment

2.7.2 Spectrum Licenses in Crown management rights

Q22. Do you have any comments on how to set the resource charge for spectrum licences in Crown management rights in 174 MHz to 184 MHz?

The licence fee for a 6.25kHz should be half that of a 12.5kHz channel to encourage spectrum efficiency. It should be possible for two contiguous 6.25kHz channels to be used together as 12.5kHz channel for DMR.

Q23. If geographic coverage is used to set the resource charge, what signal strength contour should be used to set the coverage extent? Should the coverage be limited to continuous coverage or also include fortuitous coverage? Why?

Do not support this approach.

Q24. Should any resource charge be set and imposed annually or as a single upfront payment?

No comment

Q25. Which option is preferred to manage regional variations in demand and how should the regions be identified? Do you have an alternative mechanism to manage regional variations in demand?

No comment

2.8 Competition Considerations

Q26. Do you consider that allocation of LMR spectrum rights between 174 MHz to 184 MHz should be subject to acquisition caps? If so, why and what should these caps be?

No comment

2.9 Implementation requirements

Q27. Do you consider that implementation requirements should be imposed on LMR management rights and / or spectrum licences in 174 MHz to 184 MHz? If so, why and what should these be?

No comment

Q28. Do you consider there should be any requirement regarding access to or use of other LMR frequencies if an entity holds licences in 174 MHz to 184 MHz and other LMR frequencies managed under the radio licensing regime?

No comment

3 Management Rights

Q29. What Adjacent Frequency Emission Limits and protection limits should apply to management rights for LMR in 174 MHz to 184 MHz? Should these align with the out of band emissions in the equipment standards? Why or why not?

Agree with AFEL limits aligning with the ACI performance limits stated in standards referenced in section 4.7 since these are ones that equipment is designed to meet. This is sufficient to manage interference from the Repeater to other mobiles on adjacent frequencies. However the proposed AFEL limits do not address at a repeater site the issue of receive de-sensing caused by wideband noise from a local LMR transmitter. For good design the level of this interference should be at or below the noise floor of the receiver typically around -127dBm for a 12.5kHz channel. On this basis the AFEL at the edge of the transmit band should be -108dBW/kHz.

Q30. Should management rights be created (and retained) at one channel wide or be able to be amalgamated? If amalgamated, should restrictions on the maximum channel width and number channels be specified on the management right?

No comment

Q31. What level should the power floor be set at?

The proposed Power floor corresponds to –116dBm/kHz or -105dBm in a 12.5kHz channel which is similar to the -106dBm specified for MPIS in PIB 38. Power floor should be less than -114dBm or -125dBm/kHz for a 12.5kHz channel. Please see reply to Q38.

4 Technical Requirements

4.1 Approach to technical requirements

Q32. Should the Ministry approach the technical specifications for these bands similarly to radio licensing? If so, why?

Yes, the band is being used for the similar purposes

Q33. Are there particular technical specifications which you consider must be identified?

No

4.2 Maximum transmitter power

Q34. Should the management rights set the maximum power for wanted emissions or the AFELs be relied on to manage adjacent channel emissions? Why or why not?

AFELs should be used to manage adjacent channel emissions as they relate directly to the effect of interference on an adjacent channel. This would permit the use of radio equipment with better specifications for ACI (Adjacent Channel Interference) to use higher transmitter powers.

Q35. Should private and Crown management rights be treated differently? If so, how and why?

No comment

4.3 Minimum field strength

Q36. Should a minimum field strength be specified for simplex and/or duplex LMR services between 174 MHz to 184 MHz? If so, why?

No, a minimum receive level in dBm should be used.

Q37. Should private and Crown management rights be treated differently or have different minimum field strengths specified? If so, why?

No

4.4 Coverage

Q38. Should a maximum coverage area be specified for simplex and/or duplex LMR services for Crown management rights in 174 – 184 MHz? If so, how and what should this be?
Please give reasons for your views

The coverage and interference requirements should be changed to reflect the new technology as the current values for coverage and interference in PIB38 are based on old analogue considerations and lower coverage reliabilities than is expected today where LMR has to compete with cellular.

RHW believes that the proposed new band should be reserved for digital use only and with coverage availability targets more appropriate to business critical communications that could justify the higher implementation costs for using the 174 to 184MHz band.

The current PIB38 LMR Coverage Parameters are:

Minimum receive level	*-95dbm*
MPIS	*-106dBm*

This results in a C/(N+I) of 11dB.

Note PB38 doesn't state the SINAD nor the DAQ at the minimum receive level so for the purpose of analysis it is assumed that this corresponds to a 12dB SINAD for FM and 5% BER for Digital.

For commercial quality coverage, 90% is considered the minimum with 95% expected for business critical coverage. Based on these requirements the current PIB coverage parameters are inadequate results in availabilities of less than 90% as shown in the table below.

Channel Bandwidth	*25kHz*	*12.5kHz*	
Modulation	*FM*	*FM*	*Digital (P25, DMR,dPMR)*
C/N @12dB SINAD or 5% BER	*4dB*	*7dB*	*7.6dB*
Fade Margin	*7dB*	*4dB*	*3.4dB*
Coverage Availability for Rayleigh fading with 6dB SD	*88%*	*75%*	*71%*

For business critical communications coverage availabilities of 95% are typically required and the wanted receiver threshold is based on the BER of 2% which equivalent to a 20 SINAD. On this basis the minimum C/(N+I) required is as follows:

Modulation	*Digital*
C/N for 2% BER DAQ-3.4(20dB SINAD)	*9.4dB*
Fade Margin	*10dB*
Coverage Availability for Rayleigh fading with 6dB SD	*95%*
Minimum C/(N+I)	*19dB*

On this basis the MPIS should be -114dBm assuming PIB minimum receive level of -95. This value more closely aligns with the ACMA values given in LM8 of -112dBm for VHF.

4.5 Maximum permitted interfering signal

Q39. What should the Maximum Permitted Interfering Signal be set at on LMR spectrum licences in 174 MHz to 184 MHz? Why?

See reply to 4.4 above.

Q40. Should there be any consideration made to the difference between the MPIS being set over the entire protection area and the interference threshold in PIB 38 being set at the receiver?

In PIB38 3.5.2 Interference thresholds it states the following "Land mobile repeaters are protected from harmful interference within the theoretical continuous coverage. The interfering signal is not to exceed a value of -106 dBm at the wanted receiver. This applies to both analogue and digital." This states that MPIS only applies at the repeater receiver without giving any consideration to the mobile receiver and hence the coverage of the repeater which should be protected as well. Therefore RHW supports the MPIS being applied over all the coverage area and PIB38 amended to include protection of the mobile receiver.

4.6 Analogue or Digital Services

Q41. Should only digital LMR services be permitted in the duplex and / or simplex frequencies between 174 MHz to 184 MHz? If so, why or why not?

Digital services should only be permitted in this band so that maximum spectrum efficiency can be obtained. The industry trend is to move to digital when building new networks since the benefits of digital outweigh the marginal cost increase for digital radios when compared with analogue.

4.7 Equipment Standards

Q42. What equipment standards, if any, should be applied to the use of LMR services in 174 MHz to 184 MHz? Please provide reasons for your views.

The same current equipment standards for LMR equipment should apply as manufacturers will be simply retuning existing products to the new frequency band. There is also no reason to change the standard as the primary use of the new band will be LMR.

4.8 Digital Mobile Radio (DMR) Access Codes

Q43. Should access codes be required on LMR licences in 174 MHz to 184 MHz? If so, why or why not?

Access codes should be retained for the same reason as currently required for the LMR bands.

5 'Non-Standard' LMR service configurations

5.1 Trunked dispatch

Q44. Should some channels between 174 MHz to 184 MHz be reserved for trunked dispatch services? If so, should this be provided for in private management rights and / or Crown management rights? Why?

No because it would restrict use of the band. The historical precedent for allocating bands exclusively for trunking is no longer relevant given the spectrum efficiency of digital LMR/trunking.

5.2 Linear repeaters

Q45. Should linear repeaters be allowed in the LMR channels between 174 MHz to 184 MHz? If so, should this be provided for in private management rights and / or Crown management rights? Why?

There are significant technical challenges in eliminating feedback from these devices. There are few commercial products on the market and so generally "homebrew" ones have been used. RHW doesn't generally support the use of linear repeaters preferring crossband ones instead.

5.3 Back to back linking

Q46. Should back to back linking be restricted in the LMR channels between 174 MHz to 184 MHz? If so, should this be provided for in private management rights and / or Crown management rights? Why?

Back to back linking though used for analogue LMR is not practical for digital LMR. I do not support the use of back to backing linking as it caused more problems than it solves when compared with using dedicated linking.

Q47. Should the fixed and mobile transmit channels be strictly enforced? If so, why?

Yes as doing otherwise complicates frequency planning.

6 Other Matters

6.1 Timing of 174 to 184 MHz frequencies for LMR

Q48. Do you have any comments on the proposed timing of the allocation of these frequencies?

No comment

6.2 Implementation and effectiveness review

Q49. Do you have any comments on the proposal to review the implementation and effectiveness, and / or the timing of the proposed review?

No comment

Q50. Do you have any other comments?

No