



Digital Dividend Review

Association of Professional Wireless Production Technology - APWPT

Response to consultation 'Clearing the 800 MHz band'

Date: Monday 20th April 2009

Contact Details:

**Association of Professional Wireless
Production Technologies e. V.
c/o Matthias Fehr
Erlanger Str. 9
D-91083 Baiersdorf
Germany**

Tel.: +49 (0) 9133 60 76 864

Fax: +49 (0) 9133 60 76 865

E-Mail: wolfgang.bilz@apwpt.org

Contents:

1. Executive summary
2. The 800 MHz consultation – urgent action required from Ofcom and the Government
3. Funding – provision and eligibility criteria for entitlement
4. Replacement spectrum
5. Channel 38 versus other options considered by Ofcom as replacement for channel 69
6. The necessary criteria of replacement spectrum for channel 69
7. Assessment of options that Ofcom have rejected as suitable
8. Channel 38
9. Timescales
10. Temporary PMSE access to cleared spectrum
11. Impact of new services in channel 69

1. Executive summary

- 1.1.** Ofcom have proposed to move PMSE from channel 69 into channel 38 with either the Government or new licensees covering the costs, the objective of which is to harmonise the UK's digital dividend upper cleared spectrum with other European states.
- 1.2.** The proposal to clear channel 69 of PMSE has led to a severe decline, and in some cases near-halt, in sales of channel 69 equipment; those businesses that depend on these sales are consequently under threat. Two important factors have contributed to this problem:
- 1.2.1. Under current proposals, anyone who buys/has bought channel 69 equipment subsequent to the publication of the 800 MHz consultation document will not be entitled to financial assistance¹. Therefore, those who would otherwise buy new equipment are reluctant to invest.
- 1.2.2. Suppliers of channel 69 equipment cannot offer alternative equipment (that does the same job) until replacement spectrum is both confirmed and made available on a UK-wide basis; Ofcom have not yet decided that channel 38 will be the replacement and it is not currently available on the same basis as channel 69.
- 1.3.** Users who need to buy new channel 69 equipment (i.e. that can be used and licensed UK-wide) have no other option but to invest in equipment that is not future-proofed. Again, this is because (a) viable alternative spectrum and hence equipment are not available and (b) the date of publication of the 800 MHz consultation is the proposed cut-off point for entitlement to financial assistance.
- 1.4.** In order to address the problems highlighted in (1.2) and (1.3) above, Ofcom must:
- 1.4.1. Accept the principle that, in absence of confirmation and availability of replacement frequencies and equipment, users who need new equipment have no option but to invest in equipment that operates in currently-available frequencies;
- 1.4.2. Strongly encourage the Government to make provisions for those that have

¹ Ofcom have proposed that the date of publication of the consultation document should be the cut-off date for funding

purchased and will need to purchase equipment before replacement options are confirmed and available. For example, the Government could indemnify those demonstrably necessary and reasonable investments but were risky due to regulatory developments, spectrum availability issues or uncertainty;

- 1.4.3. Confirm, as soon as possible, that channel 38 will be allocated to PMSE and awarded to the band manager; and
- 1.4.4. Make every effort to ensure that channel 38 is as widely-available for PMSE use as possible, as soon as possible. This will involve significant engagement with incumbent radioastronomy users of channel 38. This is explained in greater detail in section 2 below.
- 1.5. As the replacement for channel 69 must at least replicate its current benefits to PMSE, we agree with Ofcom that none of the following would be acceptable as a like-for-like replacement: interleaved spectrum, Channel 70, FDD Duplex split, 1785-1805 MHz and 870-876 MHz/915-921 MHz. The reasons for this are explained in greater detail in section 7 below. Having said this, any additional spectrum identified and awarded for PMSE use would, of course, be welcome.
- 1.6. If the migration of PMSE from channel 69 and the provision of replacement spectrum is considered in isolation from the wider impact of the digital dividend on PMSE spectrum access, then it would be reasonable to conclude that channel 38 is an adequate replacement. It will be available on a UK-wide basis by 2012, has a low opportunity-cost (and hence reasonable licence-fee attached to it) and lies in closer proximity to post-DSO (digital switchover) interleaved spectrum than channel 69 will.
- 1.7. However, the spectrum provided to PMSE/the band manager must take into account the wider impact of the digital dividend on PMSE spectrum access. As BEIRG has demonstrated in its responses to the cleared and geographic consultations, Ofcom's currently-available white space maps show that there will be insufficient spectrum available in order to operate necessary quantities of PMSE equipment for large-scale musical productions to be staged at certain prime venues across the UK², including at theatres in Edinburgh, Bradford, Southend, Woking, Swansea, Nottingham, Stoke, Guildford and Tunbridge Wells³. In addition, and as our models derived from Ofcom's data show, equipment costs for touring theatre will increase by a minimum of 100% post-DSO⁴ due to the increased fragmentation of available spectrum.
- 1.8. Whilst Ofcom have agreed to update the white space maps, they will not be available for some time due to the clearance of channels 61-69. Until definitive white space maps are publicly available, it is impossible to determine whether the PMSE spectrum allocation is demonstrably interference-free and sufficient in terms of quality, bandwidth and continuity to meet the PMSE sector's needs without imposing undue financial costs. Ofcom must accept that they must retain the ability to address any shortfalls in PMSE spectrum should they arise. In order to do so (and hence avoid the risk that the PMSE allocation will not be sufficient), Ofcom must do one of the following:
 - 1.8.1. Award two additional cleared channels to the band manager in addition to channel 38. In this regard, BEIRG submitted a document to Ofcom in December 2008 which stated '*We believe that channel 38 along with cleared channels 39 and 40 would offer the best replacement for channel 69. Alternatively, if channels 61 and 62 are cleared of DTT and DTT broadcasting has to spill over into channels 39 and 40, then channel 38 and the cleared channel 37, along with the interleaved spectrum in channels 39 and 40, would offer the best replacement for channel 69.*' Ofcom must explore this

² Working on the basis that a large-scale production requires over 50 MHz of interference free spectrum to operate its wireless microphones, in-ear monitor systems and wireless communications

³ <http://www.ofcom.org.uk/consult/condocs/ddrinterleaved/responses/beirg.pdf> section 1.1

⁴ <http://www.ofcom.org.uk/consult/condocs/clearedaward/responses/beirg.pdf>

option as a method of prioritising PMSE, rather than PMSE being a consequence of other developments;

1.8.2. If the 600 MHz auctions are to take place before definitive white space maps are available, hold back the two additional cleared channels from sale until it is known for certain which interleaved frequencies will be available for PMSE. The channels could be awarded to the band manager if the interleaved allocation is insufficient, or auctioned if not. This option would both mitigate the risk to PMSE and ensure efficient spectrum allocation;

1.8.3. Do not release the lower cleared channels (i.e. do not hold the 600 MHz auctions) until definitive white space maps have been published and the PMSE sector has had sufficient time to ascertain the implications. Further to this, Ofcom will be able to address any shortfalls in spectrum availability or continuity by awarding additional spectrum to the band manager.

1.9. We welcome Ofcom's commitment to ensure that 'existing authorised and planned authorised users of channels 61, 62 and 69 do not bear extra costs that must reasonably be incurred to clear the spectrum'⁵. In line with this, finance must be available when the costs to the PMSE sector arise in order to facilitate an orderly and efficient migration. The best solution would be an early Government commitment to set-aside funds and ensure that an effective distribution mechanism is established.

1.10. The eligibility criteria for entitlement to financial assistance in order to replace or modify valuable equipment that will be rendered redundant as a result of Ofcom's decisions must be fair and reasonable. To ensure this, they must take into account anomalies in the licensing scheme and the earning capacity that wireless microphones retain if they still function, irrespective of age. In this regard, we believe that Ofcom's proposed eligibility criteria are deficient and would unfairly 'miss out' those who should be entitled to financial assistance. This is explained in greater detail in section 3 below.

2. The 800 MHz consultation – urgent action required from Ofcom and the Government

2.1. For the reasons stated in sections 1.2 and 1.3 above, the publication of Ofcom's 800 MHz consultation has undoubtedly led to a severe decline and in some cases near-halt, in sales of channel 69 equipment; those businesses that depend on these sales are consequently under threat. Furthermore, and again for the reasons explained in sections 1.2 and 1.3 above, users who need to buy new channel 69 equipment (i.e. that can be used and licensed UK-wide) currently have no other option but to invest in equipment that is not future-proofed.

2.2. In order to address these immediate problems and uncertainties for manufacturers and users, Ofcom must:

2.2.1. Accept the principle that, in absence of confirmation and availability of replacement frequencies and equipment, users who need new equipment have no option but to invest in equipment that operates in currently-available frequencies. We welcome the fact that Ofcom both accepted this principle at a recent meeting with BEIRG⁶ and that Ofcom acknowledged that 'recent uncertainty about the future use of channel 69 for PMSE has led to a marked decrease in sales as users have decided to wait for clearer information before committing to long-term purchases'⁷ in the 800 MHz consultation document.

⁵ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 1.12

⁶ Agreed note of meeting 25th March 2009 states 'BEIRG asked Ofcom whether they accept that users who need new kit have no option but to invest in equipment that operates in currently-available frequencies until replacement band(s) and the corresponding kit are available; Ofcom accepted this.'

⁷ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.60

- 2.2.2. In line with their acceptance of the principle outlined in 2.2.1 above and confirmation that ‘something might be done retrospectively to help with any financial penalties inflicted’⁸, Ofcom must strongly encourage the Government⁹ to make provisions for those that have purchased and will need to purchase equipment before replacement options are confirmed and available. For example, the Government could indemnify those demonstrably necessary and reasonable investments but were risky due to regulatory developments, spectrum availability issues or uncertainty¹⁰.
- 2.2.3. Confirm, as soon as possible, that channel 38 will be awarded to PMSE/band manager¹¹
- 2.2.4. Make every effort to ensure that channel 38 is as widely-available for PMSE use as possible, as soon as possible¹². Further explanation of this requirement and the current restrictions on the PMSE use of channel 38 are explained in section 8 below. BEIRG discussed this issue with Ofcom at a recent meeting and we were encouraged by Ofcom’s approach. As Ofcom have proposed channel 38 as the best alternative to channel 69, they stated that they have been exploring the possibilities of increasing its availability prior to 2012 through dialogue with the Department of Innovation, Universities and Skills (DIUS). We welcome this and believe that the questions that need to be asked, with a view to increasing the usability of channel 38 for PMSE, are the following:
- 2.2.4.1. Can the geographical constraints on availability of channel 38 be ‘cut down’?
- 2.2.4.2. Time constraints: when (time of day/day of week/dates) is channel 38 required for radioastronomy? Can this be specified, can it be changed and can it be restricted to certain times to permit greater PMSE use of channel 38?
- 2.2.4.3. Does radioastronomy require use of the entire 8 MHz of channel 38? Can the bandwidth used by radioastronomy be reduced to allow ‘permanent’ PMSE use of the unused frequencies?
- 2.2.4.4. Would it be possible to clear channel 38 of radioastronomy before 1 January 2012, either partially or entirely?

3. Funding – provision and eligibility criteria for entitlement

- 3.1.** We welcome Ofcom’s statement that ‘the existing and planned authorised users of channels 61, 62 and 69 should not bear extra costs that they must reasonably incur in clearing this spectrum’¹³ and their proposal that ‘funding should be made available for this purpose’¹⁴. It is essential that the funds needed to provide financial assistance to all those who are entitled under the agreed eligibility criteria are available.
- 3.2.** In order to facilitate an orderly and efficient migration, finance must be available when the costs to the PMSE sector arise. The best solution would be an early Government commitment to set-aside funds and ensure that an effective distribution mechanism is

⁸ Note of BEIRG/Ofcom meeting 25th March 2009

⁹ Ofcom have confirmed that the Government is ‘able to address the problem in ways that Ofcom are not, in particular they (BERR) have different duties and objectives and more financial flexibility to meet these’.

¹⁰ Ofcom have confirmed that this might apply to those who bought/buy ‘channel 38’ equipment subsequent to the publication of the consultation document in the case that Ofcom alter their proposals.

¹¹ In a recent meeting with BEIRG, Ofcom stated that they are committed to providing a replacement for channel 69 if it is cleared and that they will announce a decision as soon as possible after the end of the consultation period.

¹² Any replacement for channel 69 needs to be available and licensed on the same terms as channel 69 currently is as soon as possible; channel 38 does not currently offer this. With current protection levels, channel 38 is not useable in several of the major PMSE markets, notably Birmingham, Manchester, Liverpool and Leeds.

¹³ <http://ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 3.27

¹⁴ <http://ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 3.27

established. As the amounts required will in all likelihood be a small fraction of the auction revenues, undue delay would cause unnecessary anxiety and uncertainty.

- 3.3.** The eligibility criteria for entitlement to financial assistance in order to replace or modify valuable equipment that will be rendered redundant as a result of Ofcom's decisions must be fair and reasonable. To ensure this, they must take into account anomalies in the licensing scheme and the earning capacity that wireless microphones retain if they still function, irrespective of age. In this regard, we believe that Ofcom's proposed eligibility criteria are deficient and would unfairly 'miss out' those who should be entitled to financial assistance. With regard to the actual amounts that will be required, all those who would be entitled to financial assistance under the agreed eligibility criteria must be provided for.
- 3.4.** For the purpose of assessing claims, Ofcom have put together four 'working assumptions' for possible criteria to be satisfied for initial consideration as to entitlement. These are listed in italics below (paragraphs and sub-paragraphs 3.4.1. – 3.4.4.2) and critiqued individually. Paragraph (3.5) below raises an additional point relating to the type of equipment to which the eligibility criteria should apply. Paragraphs 3.6 – 3.8 explain why the eligibility criteria for entitlement to financial assistance should be extended to apply to all PMSE equipment that will require modification or replacement as a result of the DDR process, not just that affected by the clearance of channel 69.

3.4.1. *Ofcom 'would only consider assistance for equipment purchased before publication of this (800 MHz) consultation document'.*

3.4.1.1. Notice of eviction is irrelevant if replacement frequencies and equipment capable of operating in those frequencies are not available at that point of notice. However, as productions and events must continue, demand for equipment still exists. If the publication of the 800 MHz document is the cut-off date for funding eligibility then those users who need to buy new kit have no option but to continue to invest in equipment which will be rendered redundant without any hope of recompense. This is not fair because they have no alternative. Therefore, Ofcom must consider assistance for all PMSE equipment purchased to operate in currently-available frequencies up to the point at which viable replacement options are available. This is discussed in greater detail in section (2) above.

3.4.2. *'Claimants would need to hold a licence to use channel 69 valid before publication of this document'.* While we understand that Ofcom do not want to reward unauthorised usage, the eligibility criteria must take the following into account:

3.4.2.1. Many users of wireless microphones and IEMs own equipment that can be deployed in channel 69, but generally do not use this channel (and hence do not licence this channel) because of congestion issues. Under Ofcom's suggested criteria, equipment that operates in channels 61-69 for example, but only licensed for use in channels below channel 69, would not be taken into consideration. This would not be fair because (a) it is equipment that operates in channel 69 and it is used on a licensed basis and (b) Ofcom have provided no alternative frequencies to the upper-cleared band which can be used by the PMSE sector in future. Therefore, all equipment that operates on frequencies that will not be available for use after DSO should be taken into account, particularly if it operates in channel 69.

3.4.2.2. A single channel 69 licence covers any number of systems.

3.4.2.3. It is the duty of the end-user of the equipment to buy the licence, not the owner of the equipment. Therefore, Ofcom's eligibility criteria must take into account the fact that rental companies or other parties might own equipment that they have never used themselves and therefore never needed to purchase a

licence to operate. For example, a rental company could rent to a theatre, which uses the equipment; it is the theatre's responsibility to buy a licence. These equipment owners must be provided with financial assistance to re-equip. It would not be fair to penalise them for not being the end-users of their equipment that will be rendered redundant after DSO. Ofcom must recognise and accept that it is the owner of the equipment, and not the licensee (which may be different parties), who is entitled to financial assistance.

3.4.2.4. As it is only necessary to have a valid licence to operate PMSE equipment (and not to own it) it is a fairly widespread practice for users to delay renewing or purchasing their channel 69 licence until they have a need to use the equipment, either again or for the first time. For example, it has been drawn to our attention that some channel 69 users have not needed a channel 69 licence over the winter months and were waiting until their next work contract to buy one or renew. Therefore, those who own and have used channel 69 equipment on a licensed basis prior to the publication of the 800 MHz condoc but didn't necessarily hold a licence at the time of publication or a certain reasonable period beforehand (as defined by their specific circumstances) must still be eligible for financial assistance. Ofcom's statement that *'claimants would need to hold a licence to use channel 69 valid before publication of this document'* is ambiguous in this regard because it is not clear when prior to publication of this document the channel 69 licence should be valid.

3.4.2.5. Ofcom need to factor-in possible delays between the purchase of equipment, and hence date of ownership, and the use of equipment (and hence requirement to licence). Just because an owner of a wireless microphone that operates in channel 69 did not hold a channel 69 licence prior to the publication of the 800 MHz consultation document does not mean that they would not have bought one at the point of use; hence they should not be precluded from receiving financial assistance.

3.4.3. *'The equipment would need to be capable of tuning to channel 69 but not channel 38'*

3.4.3.1. Whilst we accept that this criterion can apply in respect of channel 69 equipment, Ofcom must still ensure that all equipment that will be rendered redundant or require modification as a result of the clearance of PMSE frequencies is provided for.

3.4.4. *'The full lifecycle of equipment from the date of its original purchase is 10 years'*. Further to this, Ofcom have stated that the cost of replacing equipment should be *'based on the residual equivalent value of existing equipment and not the cost of buying new equipment'*¹⁵.

3.4.4.1. Whilst we note that Ofcom do not want to use *'public money...to buy new equipment that would have replaced old equipment with little remaining usable life'*¹⁶, Ofcom's understanding of the duration of 'useable life' and the use-value that functioning equipment retains is deficient.

3.4.4.2. The full lifecycle of equipment from the date of purchase should not be defined simply by the time it takes to amortise its value. Ofcom must understand that PMSE owners of the equipment need to generate returns on their investment (surpluses). But more importantly, the lifecycle of the equipment is how long it operates before it fails beyond economic repair and needs to be replaced. Wireless microphones can last for much longer than 10 years and they

¹⁵ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.69

¹⁶ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.7

retain use-value up until the point at which they need replacing; maximum depreciations are far less than the lifespan of the product. Therefore, full financial assistance must be provided to replace any equipment that is still capable of operating in channel 69 at the point at which channel 69 will be cleared of PMSE. Moreover, since Ofcom cannot predict how long that wireless microphone would continue to function if PMSE were not evicted, then the full cost of replacing that equipment should be covered by the new licensees/Government. At present, Ofcom's assumed duration of the lifecycle of the equipment is conservative and consequently will therefore unfairly penalise those who look after their equipment, or specifically buy the expensive highly-engineered product, which is built to last for at least 15 years.

- 3.5.** Ofcom should introduce an additional criterion on entitlement for funding to replace existing equipment that takes into account the fact that only certain type-approved PMSE equipment is legal in the European market. Further to this, Ofcom should compile a list of equipment that meets the legal specifications for purposes of assessing entitlement to financial assistance on a case-by-case basis.
- 3.6.** The same principle in terms of incumbent users not bearing extra migration costs and appropriate funding being provided¹⁷ must apply to all spectrum that is being cleared of PMSE use as part of the DDR process (and not just channel 69). If Ofcom also clear channels 31-40 and 61-68 of PMSE, Ofcom should ensure that existing PMSE users of these channels do not bear extra clearance costs that must reasonably be incurred.
- 3.7.** Ofcom may argue that the PMSE sector was given advance warning back in 2006 of the possible clearance of channels 31-40 and 63-68. However, giving notice of eviction, however early, is irrelevant unless alternative frequencies are provided. This has been a problem facing PMSE at least since the first Digital Dividend Review (DDR) consultation back in 2006. Whilst users have been aware of the threat to their frequencies, no decisions on alternatives have been announced; consequently, the sector has not been able to (and indeed still cannot) plan for the future. Simply stating that there will be 'broadly sufficient spectrum'¹⁸ is not the same as knowing what the available frequencies will be; until this is known, necessary manufacturing and end-user investment decisions cannot be made¹⁹.
- 3.8.** Since (a) Ofcom have accepted the principle that, in absence of confirmation and availability of replacement frequencies and equipment, users who need new equipment have no option but to invest in equipment that operates in currently-available frequencies²⁰ and (b) Ofcom has not confirmed which interleaved frequencies will be available to PMSE post-DSO²¹, Ofcom must extend the eligibility criteria for entitlement to funding to include all PMSE equipment that will require modification or replacement as a result of the termination of PMSE access to frequencies that are currently available. Ofcom may consider the possibilities explored in section (2.2.2.) above as one way of making such provisions.

4. Replacement spectrum

¹⁷ I.e. That 'existing and planned authorised users of channels 61, 62 and 69 should not bear extra costs that they must reasonably incur in clearing this spectrum'¹⁷ and the proposal that 'funding should be made available for this purpose'

¹⁸ Which BEIRG has disproved using Ofcom's own data – see BEIRG responses to cleared and geographic interleaved award consultations.

¹⁹ This issue has been drawn to Ofcom's attention on numerous occasions, by both the PMSE sector and, indeed, Parliament. An Early Day Motion tabled by Peter Luff MP on 6th November 2007 stated that 'without a concrete and detailed programme for provision of interleaved spectrum, the PMSE sector cannot adequately plan for its future'. Ofcom have still not provided this and are now not likely to do so until 2010 due to the timescale associated with the international negotiations surrounding the clearance of the 800 MHz band and reconfiguration of DTT.

²⁰ Agreed note of meeting 25th March 2009 states 'BEIRG asked Ofcom whether they accept that users who need new kit have no option but to invest in equipment that operates in currently-available frequencies until replacement band(s) and the corresponding kit are available; Ofcom accepted this.'

²¹ I.e. awarded to the band manager

- 4.1.** As we said in our submission to Ofcom in December last year, we strongly believe that two additional cleared channels in the 600 MHz band as well as channel 38 should be awarded to PMSE/the band manager in order to help alleviate the wider UHF spectrum scarcity and fragmentation problems caused to the PMSE sector by the DDR. In this regard, we highlighted cleared channels 39 and 40 as the best option. This remains our view.
- 4.2.** Analysis of ‘white space maps’, which are designed to show interleaved spectrum availability for PMSE post-DSO, are the only way by which it is possible to determine whether the ‘package’ of spectrum to be awarded to the band manager²² will be demonstrably interference-free and sufficient in terms of quality, bandwidth and continuity to meet the PMSE sector’s needs without imposing undue financial costs.
- 4.3.** After deciding²³ that PMSE access to channels 31-40 and 63-68 would be terminated and that the PMSE sector would only retain access to the interleaved spectrum in channels 21-30 and 41-60 post-DSO, Ofcom published the first and only available version of the white space maps²⁴.
- 4.4.** Based on the existing white space data generated and approved by Ofcom and available on the JFMG website, we demonstrated the following²⁵:
- 4.4.1. That there will be a dramatic reduction and increased fragmentation of useable spectrum available for PMSE post-Digital Switchover (DSO).
- 4.4.2. That there will be insufficient UHF spectrum available for PMSE post-DSO in order to operate necessary quantities of PMSE equipment for large-scale musical productions to be staged at certain prime venues across the UK²⁶, including at theatres in Edinburgh, Bradford, Southend, Woking, Swansea, Nottingham, Stoke, Guildford and Tunbridge Wells²⁷.
- 4.4.3. That the reconfiguration of the interleaved spectrum will result in a dramatic increase in the fragmentation of that available spectrum. As a consequence, equipment costs for touring theatre will increase by a minimum of 100% post-DSO²⁸.
- 4.5.** Subsequent to this, Ofcom have stated that they are now ‘refining’ the white space maps ‘in light of the DTT protection approach proposed in the geographic-interleaved consultation document’²⁹. According to Ofcom, ‘initial indications are that (the new DTT protection approach) delivers a marked improvement in the quantity of available interleaved spectrum’³⁰. However, it is important to note that, when we met with Ofcom to discuss their ‘refined’ interleaved availability data last year, it related only to indoor use; we have yet to see similar data for outdoor PMSE use. Ofcom ‘expect to publish a further statement with (their) refined assessment in the near future.’³¹
- 4.6.** Whilst we hope that the new DTT protection approach does deliver a ‘marked improvement’ in the quantity of available interleaved spectrum, we question whether any statement in the ‘near future’ can possibly provide definitive indications as to what the

²² I.e. the PMSE spectrum allocation

²³ See DDR Regulatory Statement 13th December 2007

²⁴ See DDR Regulatory Statement 16th January 2008

²⁵ See BEIRG responses to cleared and geographic interleaved award consultations

<http://www.ofcom.org.uk/consult/condocs/clearedaward/responses/beirg.pdf>

²⁶ Working on the basis that a large-scale production requires over 50 MHz of interference free spectrum to operate its wireless microphones, in-ear monitor systems and wireless communications

²⁷ <http://www.ofcom.org.uk/consult/condocs/ddrinterleaved/responses/beirg.pdf> section 1.1

²⁸ <http://www.ofcom.org.uk/consult/condocs/clearedaward/responses/beirg.pdf>

²⁹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.28

³⁰ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.28

³¹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.28

configuration and availability of interleaved spectrum will be. Ofcom themselves have said that 'as more DTT moves below channel 61 in the UK and neighbouring countries in order to clear the 800 MHz band, channels 21-60 will become more intensively used'³², which could in turn 'impact on the suitability of interleaved spectrum for PMSE'³³. As the 'materiality of this impact will be highly dependent on the exact outcomes of international negotiations and the coordination and UK planning arrangements that will flow from them'³⁴, definitive white space maps cannot be published until the international negotiations are completed. Initial indications are that final and definitive white space maps will not be available until 2010 at the earliest. In addition, even if the updated white space maps show increase in quantity of interleaved spectrum, there is no certainty that this will help to alleviate the fragmentation problem to the extent that touring productions will still be able to use the same equipment as they move around the UK (e.g. twice as much interleaved spectrum might be available in Manchester, Edinburgh, Woking and Birmingham than we thought but if available frequencies are not common to all then the problem remains).

4.7. Until definitive white space maps are publicly available, it is impossible to determine whether the PMSE spectrum allocation is demonstrably interference-free and sufficient in terms of quality, bandwidth and continuity to meet the PMSE sector's needs without imposing undue financial costs³⁵. Ofcom must retain the ability to address any shortfalls in PMSE spectrum should they arise. In order to do so (and hence avoid the risk that the PMSE allocation will not be sufficient), Ofcom must do one of the following:

4.7.1. Award two additional cleared channels to the band manager in addition to channel 38. Ofcom must explore this option as a method of prioritising PMSE, rather than PMSE being a consequence of other developments.

4.7.2. If the 600 MHz auctions are to take place before definitive white space maps are available, hold back the two additional cleared channels from sale until it is known for certain which interleaved frequencies will be available for PMSE. The channels could be awarded to the band manager if the interleaved allocation is insufficient, or auctioned if not. This option would both mitigate the risk to PMSE and ensure efficient spectrum allocation.

4.7.3. Do not release the lower cleared channels (i.e. do not hold the 600 MHz auctions) until definitive white space maps have been published and the PMSE sector has had sufficient time to ascertain the implications. Further to this, Ofcom will be able to address any shortfalls in spectrum availability or continuity by awarding additional spectrum to the band manager.

4.8. Of the options described in paragraphs 4.7.1 – 4.7.3 above, it remains our view that Ofcom should award two additional cleared channels in the 600 MHz band as well as channel 38 to PMSE/band manager. This is our preferred option for the following reasons:

4.8.1. Whilst we accept that Ofcom have improved their understanding of PMSE concerns, we are not convinced that they fully appreciate or acknowledge the value of PMSE to the economic, social and cultural life of the UK. Wireless microphones and other short range wireless devices are essential for the production of live and recorded entertainment including the Performing Arts, Broadcasting, News Gathering, Film and Independent Production, Corporate Events, Concerts, Night Venues and Sports Events. This content is consumed in a variety of ways through a multitude of media,

³² <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 3.18

³³ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 3.19

³⁴ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 3.18

³⁵ In the absence of definitive 'white space maps', and hence the ability to determine whether the interleaved spectrum is sufficient³⁵ or not, it is extremely risky to auction all of the cleared channels. If, subsequent to the release of the cleared spectrum, it transpires that the PMSE-allocation is insufficient to meet the sector's needs, Ofcom will not be able to resolve any shortfalls since they will have already sold the rights to the cleared spectrum to new licensees.

the value of which would suffer immeasurably without PMSE equipment that is essential for its production. In light of this, we strongly believe that Ofcom should make PMSE a policy priority (rather than a consequence of other developments³⁶) by awarding to the band manager sufficient additional cleared spectrum that will continue to facilitate world-class content production in the UK. Further to this, we believe that Ofcom must consider reorganising the DTT multiplexes transmissions (as they are already doing) in order to free-up additional cleared channels in the 600 MHz band³⁷, such as channels 39 and 40, so that they can be allocated for PMSE use³⁸. Indeed, it is worth reiterating that the content carried on DTT multiplex transmissions is made using PMSE equipment; it is in the interest of the broadcasters for sufficient PMSE spectrum access to be assured.

4.8.2. Ofcom's approach to providing adequate replacement spectrum needs to be consistent and fair; objectives and policy that apply to the migration of PMSE from channel 69 must apply to any and every migration of PMSE from spectrum that it currently uses. Ofcom have stated that they need to clear channels 61, 62 and 69 'in a way that does not adversely affect the important services that would have been provided using this spectrum'³⁹ and that doing so involves 'finding other spectrum that is a suitable replacement for channels 61, 62 and 69'⁴⁰ and 'plan(ning) the change from using one set of frequencies to another very carefully so that we avoid any significant adverse effect on...PMSE'⁴¹. Ofcom have also stated that a key element of clearing the 800 MHz band includes 'replacing channels 61, 62 and 69 with other channels (principally channels 38-40 from the lower band) for DTT and PMSE' and that 'it is important (to) identify an alternative to channel 69 that offers...comparable utility for wireless microphones (in terms of capacity and freedom from interference)⁴². In line with this reasoning, Ofcom must identify alternatives to all frequencies that are being cleared of PMSE that offer 'comparable utility for wireless microphones in terms of capacity and freedom from interference'⁴³; under current proposals this includes the interleaved spectrum in channels 31-37 and 61-68 in addition to channel 69. Whilst we acknowledge and indeed welcome the fact that Ofcom have decided to award most of the interleaved spectrum in channels 21-30 and 41-60 (and possibly channels 39 and 40), the current white space maps show that its usability in terms of capacity will be significantly less than current interleaved spectrum.

4.8.3. As Ofcom acknowledge, PMSE users 'place great value on channel 69 because it is adjacent to interleaved spectrum in channels 67 and 68'⁴⁴. One of the reasons for this, as Ofcom appreciate, is that 'channels 67 and 68...afford microphone users access to the 24 MHz in channels 67-69 on a near-UK-wide basis'⁴⁵. As Ofcom have acknowledged the importance of PMSE access to 24 MHz of UHF spectrum on a near-UK-wide basis, they should replicate this by providing 24 MHz of contiguous UHF

³⁶ For example, Ofcom's decision to adjust the DTT protection parameters was based on an analysis that did not even consider the benefits to PMSE - <http://www.ofcom.org.uk/consult/condocs/ddrinterleaved/interleaved.pdf> see sections 5.31-5.46

³⁷ I.e. In addition to channel 38

³⁸ . Regrettably, 'all three options' Ofcom have considered for the migration of DTT 'involve channels 39 and 40 as replacements for channels 61 and 62'³⁸ and were based solely on 'consistency with the policy objectives for DTT coverage after DSO and minimising the impact on viewers of broadcasts from existing DTT multiplexes'³⁸. We firmly believe that the benefits to the PMSE sector should be considered when assessing potential options for the replacement spectrum for DTT in channels 61 and 62.

³⁹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 1.11

⁴⁰ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 1.11

⁴¹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 1.11

⁴² <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.12

⁴³ and plan the frequency change very carefully to avoid any significant adverse effect on PMSE users. Avoiding significant impact on PMSE users includes avoiding undue financial penalties in terms of additional equipment procurement

⁴⁴ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.5

⁴⁵ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.5

spectrum as a replacement; namely two cleared channels in the 600 MHz band⁴⁶ in addition to channel 38⁴⁷.

- 4.8.4. Channel 38 is allocated for radioastronomy in other European states and will not be available for PMSE. If Ofcom allocate additional cleared channels for PMSE use then this could reduce equipment costs significantly, provided that the corresponding additional bands are available for PMSE use in Europe (i.e. 'channel 38' equipment would not be a 'stand-alone' system for the UK).
- 4.8.5. Additional spectrum should be allocated for PMSE use to compensate for the fact that any 'more intensive' use of channels 21-60 for DTT will inevitably decrease the amount of interleaved spectrum available for PMSE (as per the international negotiations mentioned in paragraph 4.6).
- 4.8.6. Channels 37-40 lie in the 470-862 MHz band, upon which the PMSE sector is and will continue to be dependent for use of wireless microphone technologies at least into the medium term⁴⁸.
- 4.8.7. Channels 37-40 lie in very close proximity to the interleaved spectrum in channels 41 upwards, hence if they are retained for PMSE use, this may⁴⁹ help with the fragmentation problem⁵⁰.
- 4.8.8. Channels 37-40 are currently used by high-end wireless microphones and, hence new technologies would not have to be developed (although the equipment designed for community and other lower-end use that currently operates in channel 69 does not exist for these channels and will therefore have to be developed and produced).

5. Channel 38 versus other options considered by Ofcom as replacement for channel 69

- 5.1. It is our view that the spectrum provided to PMSE/the band manager must take into account the wider impact of the digital dividend on PMSE spectrum access and that two additional cleared channels in the 600 MHz band (as well as channel 38) should be allocated for PMSE use post-DSO. Whilst nothing in this section must be taken to detract from this, if the migration of PMSE from channel 69 and the provision of replacement spectrum is considered in isolation from the wider impact of the digital dividend on PMSE spectrum access, then it would be reasonable to conclude that channel 38 is the best replacement of those considered by Ofcom in the 800 MHz consultation document. Notably, it will be available on a UK-wide basis by 2012, has a low opportunity-cost (and hence reasonable licence-fee attached to it) and lies in closer proximity to post-DSO

⁴⁶ If DTT services are deployed in channels 39 and 40, then depending on the availability of the interleaved spectrum in these channels, channel 37 would most likely be required in addition to channel 38 to replicate the current availability of channels 67-69.

⁴⁷ Ofcom have said that their 'current planning models' suggest that 'DTT is likely to use channels 39 and 40 relatively lightly under the hybrid option' and that 'as a result, PMSE could enjoy access to spectrum in the 24 MHz tuning range of channels 38-40 very similar in quantity to that currently available in channels 67-69'. If DTT is deployed in channels 39 and 40, we are sceptical about Ofcom's definition of 'very similar quantity'. As stated above, any replacement for channel 69 should also lie adjacent to channels that, at the very least, replicate the capacity and usability of channels 67 and 68. In absence of the publication of definitive white space maps, we are not in a position to judge whether the interleaved capacity and usability of channels 39 and 40 will be sufficient.

⁴⁸ See independent report prepared for Ofcom by CSMG

<http://www2.ofcom.org.uk/radiocomms/ddr/documents/wirelessmics.pdf>

This states the following: 'The key implication of this analysis is that UHF Bands IV and V spectrum will remain critical to many PMSE users (fixed-venue and touring performances, concerts and events, studio-based programme making, complex ENG / OB use, on-site TV / film production and many community users) through to the medium term (2012 - 2018)'

⁴⁹ We use the word 'may' because the adjacency of cleared PMSE channels to interleaved channels is not relevant re the fragmentation issue if those interleaved channels are heavily used for DTT (and hence not available for PMSE).

⁵⁰ If DTT services are deployed in channels 39 and 40 then channels 37 and 38 would lie adjacent to any new interleaved spectrum created in channels 39 and 40.

(digital switchover) interleaved spectrum than channel 69 will. However, there are numerous restrictions to its current availability and the terms of the licensing scheme that mean it does not offer an immediate like-for-like replacement for channel 69. Ofcom must endeavour to remove these restrictions as soon as possible.

5.2. As the replacement for channel 69 must at least replicate its current benefits to PMSE, we agree with Ofcom that none of the following would be acceptable as a like-for-like replacement: interleaved spectrum, Channel 70, FDD Duplex split, 1785-1805 MHz and 870-876 MHz/915-921 MHz. Having said this, any additional spectrum identified and awarded for PMSE use would, of course, be welcome.

5.3. In order to fully assess the options that Ofcom have considered as potential replacements for channel 69, it is necessary to evaluate these in light of certain necessary criteria that any adequate like-for-like replacement must satisfy. Section 6 of this document explains these necessary criteria, section 7 explains why certain options are not acceptable and section 8 describes the merits of channel 38 and what must be done to ensure that it can offer a like-for-like replacement as soon as possible.

6. The necessary criteria of replacement spectrum for channel 69

6.1. UK-wide availability and licensed access

6.1.1. Channel 69 is the only UHF band available for wireless microphones and in-ear monitors at every location across the UK. This is critical to PMSE users as it means that some users can move from location to location without equipment having to be swapped or replaced and the equipment can be licensed on an uncoordinated basis (non site-specific). Any replacement for channel 69 must be available for PMSE use on a nationwide basis and licensable on these terms.

6.2. Proximity to interleaved spectrum and importance of contiguous bands

6.2.1. Channel 69, of course, lies adjacent to channels 61 to 68, which are used heavily for wireless microphones and in-ear monitors and all of which are accessible in varying locations across the UK. Relative to other UHF channels used for analogue television broadcasting, the interleaved spectrum available for PMSE in channels 67 and 68 is greater. Indeed, the small amount of analogue television broadcasting in these bands means that they are almost as useful to the PMSE sector as contiguous cleared bands would be (i.e. those available on a UK-wide basis). Therefore, any replacement for channel 69 must replicate the proximity of channel 69 to other available UHF spectrum (i.e. directly adjacent to it), and those adjacent bands must be as or more available for PMSE use as channels 67 and 68 currently are⁵¹.

6.2.2. As channel 69 is currently heavily congested, users whose equipment operates in any of channels 61-68 as well as channel 69 often migrate into these less-congested areas of spectrum where available. As a consequence of the clearance and subsequent release of channels 61-68 for new uses, this (relatively ad hoc) migration will no longer be possible. Therefore, if channel 69 is awarded to the band manager it will become more congested and the risk of interference will be higher; this demonstrates why any possible replacement for channel 69 should include more than one 8 MHz band and lie adjacent to other spectrum that will be available for PMSE use. At the very least, the replacement spectrum should replicate the current spectrum availability in channels 67, 68 and 69⁵².

⁵¹ It is worth noting here that, in June 2008, Ofcom stated in their consultation document on the detailed design of the Digital Dividend Review (DDR) cleared award that channel 69 in isolation is of limited value to PMSE users because touring companies, who generally use this spectrum, also require access to channels 67 and 68

⁵² As a justification for migrating PMSE users from channel 69, Ofcom have suggested that 'channel 69 in isolation is of limited value to PMSE users because many touring companies, who generally use channel 69, need to use more than 8 MHz to fulfil demand'⁵². While this is true, Ofcom seem to be ignoring the fact that it was they who created this

6.2.3. We are pleased that Ofcom acknowledge the fact that PMSE users 'place great value on channel 69 because it is adjacent to interleaved spectrum in channels 67 and 68'⁵³. One of the reasons for this, as Ofcom appreciate, is that 'channels 67 and 68...afford microphone users access to the 24 MHz in channels 67-69 on a near-UK-wide basis'⁵⁴. As Ofcom have acknowledged the importance of PMSE access to 24 MHz of UHF spectrum on a near-UK-wide basis, they should replicate this by providing 24 MHz of contiguous UHF spectrum as a replacement.

6.3. No interference from users in adjacent bands

6.3.1. Channel 69 currently lies adjacent to unlicensed low-power PMSE users in channel 70 and analogue television broadcasting and low-power PMSE users in channels 67 and 68. Channel 69 users suffer no interference problems from users in these adjacent bands. Therefore, any replacement for channel 69 must not suffer any interference problems from users in adjacent bands. If necessary, guard bands must be established adjacent to any replacement for channel 69 to prevent out-of-band interference from high-power users. As any guard bands clearly must not reduce the useable size of or impinge upon the PMSE-allocated bands; they must lie adjacent to the PMSE band rather than be included in the PMSE allocation (e.g. if 24MHz of cleared spectrum was awarded to the band manager with PMSE obligations but the threat of interference from high-power users in adjacent bands meant that guard bands were required, then these guard bands must be granted in addition to the 24MHz as opposed to parts of the allocated 24MHz constituting the guard bands). We are aware that Ofcom have already published a study on the potential for interference from mobile terminals in the DDR upper sub-band to PMSE equipment in channel 69, which suggests that no guard-band is necessary. We are concerned that Ofcom will seek to apply the same results to any new spectrum replacing channel 69 because the study was seriously flawed. It considers only the most basic case of a single user equipment (UE) interfering with a single radio microphone (RM) due to bandwidth limitations of both devices. It failed to consider intermodulation products (IP's) due to either (a) two or more UE's mixing together to generate IP's on multiple frequencies within the PMSE band, or (b) one or more UE's mixing with one or more RM's to generate IP's within the PMSE band. Intermodulation is a serious issue for users of radio mics because it is the ultimate governing factor that limits the density of RM use within a given frequency band. The presence of strong adjacent UE signals will greatly limit the number of RM's that can be used within the band. When frequency assignments are made for RM's at any given location, the frequency of each individual RM is carefully calculated to avoid intermodulation interference. It is not possible to take account of UE frequencies in advance because they will not be known in advance and may change continually. In assessing the need for guard-bands, Ofcom must commission a full study taking proper account of intermodulation effects in the presence of multiple adjacent UE's and multiple RM's. This will involve practical tests as well as theoretical ones: BEIRG members would be glad to advise and assist with suitable equipment and locations.

6.4. Replacement spectrum must be in the UHF (470-862 MHz) band

6.4.1. There are very few viable frequencies available for wireless microphones, IEM and

situation in the first place and it was they who refused to address the problem (that they now seem to appreciate). We have informed Ofcom on numerous occasions that professional PMSE users of channel 69 also require access to contiguous adjacent spectrum and hence suggested that cleared channels 67 and 68 should be held back for PMSE use as well as channel 69. Despite BEIRG's arguments, back in December 2007 Ofcom announced that channel 69 would be awarded to the band manager but channels 63-68 would be included in the DDR auctions. Now, Ofcom are using the isolation of channel 69, a situation of their own creation and something we urged them not to do, as a justification for migrating PMSE from that channel.

⁵³ <http://ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.5

⁵⁴ <http://ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.5

talkback use. Wireless microphones and IEMs use 470 – 862 MHz almost exclusively due to the quality and quantity of spectrum available in this band along with use of this band on a long-term basis being secured by virtue of the coexistence with analogue television broadcasting as the primary user. Talkback uses 425.3125-469.8750 MHz almost exclusively for similar reasons (although talkback does not have the protection of the analogue television umbrella as interleaved spectrum users do). In general, the bands of low or no PMSE demand to be awarded to the band manager will either be too high or the bandwidth too narrow to be viable for wireless microphone or IEM use. Users of wireless microphones and IEMs depend almost exclusively on the UHF spectrum and will continue to do so at least into the medium term. This conclusion was confirmed by CSMG in their report that was recently published by Ofcom. Indeed, Ofcom themselves have stated that ‘these (high-demand) bands are often critical to PMSE users, not least as there are no identifiable alternatives to many of these bands in the short term to medium term’⁶. As the UHF band is a high-demand PMSE band, it can be reasonably inferred that Ofcom agree with both us and CSMG that there are no viable alternatives to the UHF band for use of wireless microphone technology in the short to medium-term. Therefore, any replacement(s) for channel 69 must include spectrum in the UHF band.

6.5. Low opportunity-cost

6.5.1. Channel 69 has a very high opportunity cost and, if awarded to the band manager, this would be reflected in the AIP licence fee. Ofcom must ensure that the charges imposed on the PMSE sector for use of its spectrum are reasonable and affordable.

7. Assessment of Options that Ofcom have rejected as suitable

7.1. Interleaved spectrum

7.1.1. Ofcom have assessed the suitability of the interleaved spectrum as a replacement for channel 69. Whilst they are correct to reject this as a suitable option, their reasoning gives the impression that the interleaved spectrum might be more suitable than it actually is.

7.1.2. By its very nature, the interleaved spectrum is not and will not be available on a UK-wide basis⁵⁵. The fragmentation problem applies to the very interleaved spectrum that this option would involve. Moreover, the interleaved spectrum to be awarded to the band manager will be significantly less in terms of bandwidth than the spectrum that interleaves between existing analogue television broadcasts. In all respects, the interleaved spectrum would not offer an adequate replacement for channel 69. Indeed, as it is going to be awarded to the band manager with PMSE obligations anyway, it would not even constitute a replacement for channel 69.

7.1.3. Ofcom’s assertion that ‘the interleaved spectrum as a whole will provide sufficient capacity to support eight wireless microphones per channel without interference’⁵⁶ misses the point and is an inaccurate representation of the availability of the interleaved. Of course, if an 8 MHz channel within the spectrum reserved for TV multiplexes is unused for broadcasting and hasn’t been sold via the geographic interleaved auctions, it will be available for PMSE and eight wireless microphones should be able to be deployed in this channel. However, this tells us nothing about whether the same equipment can be deployed from location to location (fragmentation issue) and whether the overall availability in each location is sufficient to cater for peaks in demand. In addition, current data on the interleaved spectrum post-DSO shows that many interleaved channels have only a 5.8 or 6.8 MHz bandwidth availability for PMSE and not a ‘full 8 MHz’.

⁵⁵ I.e. The nature of DTT transmissions means that there will be no channels that are unused for DTT throughout the UK, and hence available for PMSE

⁵⁶ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.29

- 7.1.4. Ofcom are right to say that there are ‘challenges to its (interleaved) offering UK-wide coverage’, but their explanations as to why have ignored the historical context. This gives the false impression that (a) issues might easily be solved and (b) that the challenges are in some way the fault of the PMSE community. Ofcom have also failed to highlight the fact that a UK-wide channel helps to keep equipment costs down for both professional and community users.
- 7.1.5. While the effect of ‘its (interleaved) inherent geographic constraints’ and ‘the inability of most analogue wireless microphones to tune over a range of 24MHz⁵⁷’ are important factors in the ‘challenge’, Ofcom must understand that these issues are the product of current spectrum availability and the need to manufacture equipment that meets PMSE demand in the most commercially viable way. Quite simply, most extant wireless microphones in use are unable to tune over a range of more than 24 MHz because, up until the DDR, the necessity to do so never existed in the context of interleaved spectrum. Currently, a tuning range of 24 MHz is sufficient to support eight wireless microphones because a sufficient proportion of the frequencies within three adjacent channels reserved for TV broadcasting are available in most locations across the UK,.
- 7.1.6. The expected increase in fragmentation of interleaved spectrum has increased the necessity for a wider tuning range. But equipment with a wider tuning range is more expensive and more susceptible to greater interference; if no UK-wide replacement for channel 69 was offered and these users were forced into the interleaved spectrum, there would be considerable financial implications of having to invest in equipment with a wider tuning range. In addition, the licensing costs would be higher since frequency coordination would be required in every location as opposed to users being covered by a single channel 69 licence that applies across the UK.
- 7.1.7. Further to this, it is unclear what Ofcom are attempting to assert in section 5.30 when they say that ‘more interleaved spectrum can be used by wireless microphones after DSO...with some approaching UK-wide coverage⁵⁸’. The ability for 8 wireless microphones to be operated by certain equipment with a certain tuning range in every location across the UK will be dictated by the availability and fragmentation of the interleaved spectrum. While a wider tuning range of course increases the likelihood of this being possible, we still do not know how wide such a tuning range would need to be. In addition, we do not even know that there will be sufficient available interleaved spectrum in every location across the UK. If there is not, then no equipment could operate on a UK-wide basis, however wide the tuning range. In addition, Ofcom must not forget that they have created a situation whereby equipment costs for PMSE users are likely to increase dramatically because (a) the majority will need to be replaced prematurely and (b) a wider tuning range will be required to exploit the interleaved spectrum; they should do all they can to reassess the impact of DSO, meet costs incurred, as is consistent with their objective to minimise disruption to the PMSE community.
- 7.1.8. Ofcom have recognised that the interleaved spectrum as an alternative to channel 69 ‘would entail the greatest potential for disruption to users because of the need for wireless microphones able to tune across more than 24 MHz⁵⁹’. They are also aware of the danger that ‘new equipment would not be available to a large number of PMSE users in the timescales we are envisaging for clearing channel 69⁶⁰’. While Ofcom are correct to highlight this risk, they must recognise that a demand exists for channel 69 equipment now; any delay between the proposal to clear channel 69/cut-off date for funding provision and the availability of the equipment that operates in the

⁵⁷ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.29

⁵⁸ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf>

⁵⁹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.52

⁶⁰ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.52

replacement spectrum means that users who require new equipment will be forced to invest in that which will be rendered redundant in a short period of time.

7.2. Channel 70

7.2.1. We agree with Ofcom⁶¹ that channel 70 does not represent a realistic alternative to channel 69 for PMSE. As channel 70 is and will continue to be available for PMSE use on an unlicensed basis anyway, it would not constitute a replacement for channel 69. Also, the term channel 70 is in itself misleading as currently; only 2 MHz is available for PMSE use as opposed to 8 MHz in channel 69. As per the DDR regulatory statement of 13th December 2007, Ofcom recognises the importance that professional and community PMSE users attach to the high quality, interference-free spectrum that licensing produces in channel 69. If Ofcom evicted PMSE from channel 69 and did not offer any replacement other than encouraging increased use of channel 70 as an unlicensed band, Ofcom would clearly have dismissed their own arguments about the importance of a licensed nationwide band. Moreover, Ofcom themselves have stated that channel 69 in isolation is of limited value to PMSE users because touring companies, who generally use this spectrum, also require access to channels 67 and 68. This is why Ofcom claim that PMSE migration from channel 69 would be on the table irrespective of the plans for pan-European harmonisation for mobile. Post-DDR, channel 70 will be even more isolated from the interleaved spectrum than channel 69 will be. Again, if channel 70 was offered in isolation as a replacement for channel 69 then this would disregard Ofcom's own arguments. In addition, if channel 69 is included in the DDR auctions then channel 70 may not even be useable for low-power PMSE applications due to interference from high-power applications (i.e. mobile phone networks) deployed in the adjacent channel 69.

7.3. FDD duplex split

7.3.1. Ofcom are right to conclude that the potential FDD duplex split cannot be considered a viable alternative to channel 69 for PMSE⁶², one of the reasons being that 'we will not know whether it will even exist for a considerable period'⁶³.

7.3.2. The mobile phone companies have suggested that if channels 61, 62 and 69 are included in the DDR cleared award and they buy channels 61-69 between them and deploy mobile networks in them, then for technical reasons a 8-12 MHz gap in the middle of this band (centred around channel 65) would be created. As they say that they cannot envisage this spectrum being useful to any sector other than PMSE, they believe that it could offer an ideal long-term and pan-European replacement for channel 69 with a low opportunity cost and hence low-AIP charge attached to it. There are, however, several problems with this option and too many uncertainties involved:

7.3.2.1. The potential creation of the duplex gap depends on the mobile companies actually securing channels 61-69 through the DDR auction process. In a technologically and service-neutral mechanism for spectrum release, this is by no means certain. It is possible, though admittedly unlikely, that users other than mobile companies will buy the spectrum. If this happened then no duplex gap would be created.

7.3.2.2. Even if the mobile companies secured channels 61-69 through the DDR auction process, it is still not clear that the duplex gap would be created. Such an eventuality would presumably require considerable cooperation, coordination and agreement between the rival mobile companies over the need for and location of a duplex gap, and for the spectrum to be divided in a certain way. We are not confident of such an outcome.

⁶¹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.44

⁶² <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.41

⁶³ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.42

- 7.3.2.3. Even if a duplex gap were created, it is not clear who would own it (whether a combination of the mobile companies or just one of them) and what the mechanism for licensing it would be.
- 7.3.2.4. If a “duplex gap” was created and it was licensable for PMSE use via the band manager, it is by no means certain that it would be useable for low-power PMSE applications. The RF noise floor in the “duplex gap” would most probably be elevated such that it may be too high to enable any low-power PMSE applications to be usefully or reliably deployed anywhere in it. Firstly there could be considerable interference due to spurious emissions from the high-power downlink transmitters which would form the infrastructure of any mobile networks deployed in the Channel 61 – 69 bands. The downlinks would most likely operate on the frequencies below the duplex gap. Any spurious emissions from the uplink transmissions of mobile devices operating above the duplex gap will only further add to the noise floor on an unpredictable and sporadic basis (bearing in mind that absolutely no interference can be tolerated for PMSE productions).
- 7.3.2.5. We are not aware of any results from testing that has been carried out to assess potential usability of a duplex gap for low-power PMSE applications. Therefore, any duplex gap could not constitute a replacement for channel 69 because the extent of its usability is not known.
- 7.3.2.6. Even if a duplex gap were created and it was found to be useable for low-power PMSE applications, the long delay between the date of any announcement that PMSE use of channel 69 was to be discontinued and the date at which the duplex gap would become available for PMSE use would cause significant problems for the PMSE industry and particularly to those manufacturers and suppliers of equipment that operate in channel 69. As the future of channel 69 is currently uncertain, users are currently reluctant to invest in any new equipment that operates in that channel. Consequently, businesses that manufacture and supply channel 69 equipment are now experiencing a significant drop in sales, to the extent that a number of UK firms have had to lay off the majority of their staff and are on the brink of financial ruin. If it is decided that channel 69 will be included in the DDR auctions rather than awarded to the band manager, then from that point it is likely that little or no new equipment that operates in channel 69 will be purchased. If no replacement for channel 69 (that satisfies all the criteria outlined in section 6 above) in which PMSE equipment can operate is available by the time it is decided (if it is decided) that channel 69 is to be included in the DDR auctions, then many UK businesses will face financial ruin. The duplex gap clearly could not be such a replacement since it would only be available for PMSE use after the service and technology-neutral DDR auctions have taken place.
- 7.3.2.7. To offset the problems associated with the delay between the potential decision to include channel 69 in the DDR auctions and availability of a potential duplex gap, it might be possible for Ofcom to award to the band manager 8-12 MHz of spectrum in the upper cleared band as centred around channel 65 prior to the DDR auctions and prior to any announcement about the future of channel 69. However, such a decision would still not ensure that this spectrum would be useable for PMSE applications once high-power networks are deployed in the adjacent bands. In addition, while 8-12 MHz centred around channel 65 would be closer to the interleaved spectrum than channel 69 (and therefore, in theory, slightly less ‘isolated’), in practice it would not be sufficiently close to make any difference to the need for replacement PMSE equipment and it would not be as close to interleaved spectrum as any combination of channels 37, 38, 39 and 40 would be.

7.4. 1785-1800 MHz

- 7.4.1. Whilst we advocate the retention of the 1785-1800 MHz band for PMSE use⁶⁴, we agree with Ofcom that it does not offer a viable alternative to channel 69. We agree that its isolation, lack of UK coverage⁶⁵ and lack of equipment availability⁶⁶ are important reasons why. A portion of this band would not be available in Northern Ireland and hence not on a UK-wide basis. In terms of frequency, it lies a great distance away from the interleaved spectrum⁶⁷; any PMSE equipment manufactured to operate in this band would be restricted to it. We are not aware of any existing wireless microphone technology that is capable of operating in these bands. If this technology does exist, it is certainly unproven.
- 7.4.2. In respect of the 1785-1800 MHz band, Ofcom stated that ‘we have become aware that large theatrical productions are increasingly using digital wireless microphones in UHF Bands IV and V with high reported performance standards’⁶⁸. While digital wireless microphones may have been deployed, their usage is extremely uncommon and the CSMG report shows that there is no evidence to suggest that they are necessarily any more spectrally efficient than their analogue counterparts. Aside from this, they were apparently used in the UHF spectrum, not the 1785-1800 MHz band.
- 7.4.3. Ofcom incorrectly stated that the 1785-1800 MHz band was ‘identified as a possible alternative by BEIRG in its response to the band manager consultation document’⁶⁹. Firstly, we identified no possible alternatives to channel 69 in our response to the band manager consultation document⁷⁰; indeed, Ofcom’s possible u-turn with regard to the future of channel 69 had only just been raised at this point. Secondly, in our document on the future of channel 69 submitted in December, to which we presume Ofcom are referring, we referred to the 1785-1800 MHz band because Ofcom, not us, had identified this as a possible replacement for channel 69.

7.5. 870-876 MHz and 915-921 MHz

- 7.5.1. These bands would be available on a nationwide basis but do not lie either in the 470-862 MHz band or in close proximity to the interleaved spectrum, which would be a preferred requisite for any direct replacement. These bands have a high opportunity cost, which would (presumably) be reflected in the AIP charges that the band manager would have to pay for the licence and hence prices PMSE users would have to pay. In addition, these bands are unsuitable due to the close proximity of GSM cellular radio bands.

8. Channel 38⁷¹

⁶⁴ In line with its current allocation

⁶⁵ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.48

⁶⁶ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.47

⁶⁷ In terms of spectral proximity – frequency

⁶⁸ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.47

⁶⁹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.23

⁷⁰ <http://www.ofcom.org.uk/consult/condocs/bandmngnr/responses/beirg.pdf>

⁷¹ In the consultation document, Ofcom state that channel 38 was ‘put forward as a possible replacement by a number of stakeholders, including BEIRG’; this statement is disingenuous. Prior to the publication of the consultation, BEIRG submitted a document to Ofcom on their proposed clearance of PMSE from channel 69. In this document, we put forward the necessary criteria for any replacement spectrum, evaluated the options that Ofcom had put to us and stated what we felt would offer the best solution in the context of the wider effects of the DDR on the PMSE sector. Channel 38 was one of the options that Ofcom said they were considering as a replacement for channel 69; we did not put this forward. What BEIRG said, in writing and on multiple occasions prior to the publication of the 800 MHz consultation, was the following: ‘we believe that channel 38 along with cleared channels 39 and 40 would offer the best replacement for channel 69. Alternatively, if channels 61 and 62 are cleared of DTT and DTT broadcasting has to spill over into channels 39 and 40, then channel 38 and the cleared channel 37 along with the interleaved spectrum in channels 39 and 40 would offer the best replacement for channel 69’.

- 8.1.** As stated above, if the migration of PMSE from channel 69 and the provision of replacement spectrum is considered in isolation from the wider impact of the digital dividend on PMSE spectrum access, then it would be reasonable to conclude that channel 38 is the best replacement of those considered by Ofcom in the 800 MHz consultation document. Notably, it will be available on a UK-wide basis by 2012, has a low opportunity-cost (and hence reasonable licence-fee attached to it) and lies in closer proximity to post-DSO (digital switchover) interleaved spectrum than channel 69 will. However, there are numerous restrictions to its current availability and the licensing scheme that mean it does not offer an immediate like-for-like replacement for channel 69. Ofcom must endeavour to remove these restrictions as soon as possible.
- 8.2.** Ofcom have incorrectly stated that channel 38 ‘already offers near-UK-wide coverage for PMSE’⁷² and that ‘the existing ability of wireless microphones to use this spectrum across almost all of the UK means there are no absolute barriers to beginning the move from channel 69 at an early date’⁷³. These statements are incorrect; Channel 38 is unavailable for PMSE use in large portions of the East and North-West of England because of the necessity to protect radioastronomy. With current protection levels, channel 38 is not useable in several of the major PMSE markets, notably Birmingham, Manchester, Liverpool and Leeds. Ofcom have stated that UK radioastronomy use of channel 38 will continue until 1st January 2012. If this is the case, then it will not offer a like-for-like replacement for channel 69 in terms of UK-wide availability until this point⁷⁴. As stated in section 2 above, Ofcom should make every effort to ensure that channel 38 is as widely-available for PMSE use as possible, as soon as possible. This will require engagement with radioastronomy users in the ways described in section 2 above.
- 8.3.** At a recent meeting, Ofcom agreed that, if channel 69 is cleared then it would be helpful to know the availability over time of any replacement channel(s) because this would help facilitate an orderly and efficient migration of users from channel 69. If Ofcom decide that channel 38 will be allocated for PMSE use then any ‘moving maps’ depicting phased availability of this channel would need to take into account (1) the requirements for radioastronomy (including the answers to the four questions in section 2 above), (2) the protection of television broadcasts in adjacent channels⁷⁵ and (3) the discrepancy between indoor and outdoor use.
- 8.4.** The existing licensing scheme for channel 38 does not work in the same way as that for channel 69; a shared channel 69 licence allows a user of this channel to deploy their equipment anywhere across the UK on 14 spot-frequencies without extra cost or planning whereas users of channel 38 have to licence each individual frequency in each individual location when use is required. While we understand that the licensing scheme applied to the replacement channel(s) may be constrained by the availability of that replacement, Ofcom must make every effort to ensure that the benefits of the channel 69 licensing scheme are replicated in the replacement channel as soon as possible until any new licensing arrangements are proposed by the band manager, accepted by the PMSE community and implemented.
- 8.5.** As stated in paragraph 6.3.1 above, any replacement for channel 69 must not suffer any interference problems from users in adjacent bands. If necessary, guard bands must be established adjacent to any replacement for channel 69 to prevent out-of-band interference from high-power users. As any guard bands clearly must not reduce the useable size of or impinge upon the PMSE-allocated bands; they must lie adjacent to the PMSE band rather

⁷² <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.32

⁷³ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.56

⁷⁴ Indeed, Ofcom acknowledge that ‘once radioastronomy in the UK stops using channel 38, the geographic coverage of this channel for wireless microphones should become fully UK-wide as opposed to near-UK-wide as at present. This would make channel 38 a much closer alternative to channel 69 than it is at present’

⁷⁵ The requirement to protect television transmissions in adjacent channels 37 and 39 places restrictions on the use of channel 38 for PMSE in addition to radioastronomy.

than be included in the PMSE allocation⁷⁶. Ofcom are right to highlight that they ‘will not know how adjacent cleared spectrum, particularly channel 37, will be used until after the cleared award has taken place’⁷⁷, the implication being that there is a risk of harmful interference to PMSE from potential users of channel 37. However, rather than aiming to minimise the risk of harmful interference to PMSE, we are extremely disappointed that Ofcom are instead trying to determine the ‘specific technical conditions of PMSE use of channel 38’ in order to ‘minimise the risk of harmful interference to new services in channel 37’⁷⁸. If it is deemed that a guard band is appropriate and that channel 37 should be included in the DDR auctions rather than awarded to the band manager, then this must not take-up any bandwidth that would otherwise be available to PMSE in channel 38.

8.6. Ofcom have acknowledged that ‘one of the key benefits to PMSE of channel 69 is its adjacency to channels 67 and 68’⁷⁹ because they ‘are lightly used for analogue terrestrial television and so offer good coverage of the UK for wireless microphones in their own right’. As stated above, any replacement for channel 69 should also lie adjacent to channels that, at the very least, replicate the capacity and usability of channels 67 and 68. If Ofcom decide that channel 38 will be the replacement for channel 69 but do not agree with us that cleared channels 39 and 40 should be allocated to PMSE in addition, Ofcom must make every effort to ensure that any channels allocated for DTT that lie adjacent to channel 38 are used as lightly as possible by DTT to ensure greatest possible availability for PMSE⁸⁰ (i.e. we would favour the implementation option that ensures maximum availability of adjacent interleaved channels for PMSE use⁸¹). If Ofcom decide that DTT will be deployed in cleared channels 39 and 40, then we would urge them to produce white space maps showing interleaved availability and configuration in these channels as soon as possible so the PMSE sector can ascertain how useable they will be post-DSO and plan for the future.

9. Timescales

9.1. Ofcom have suggested that a timescale of three years would be would be ‘a plausible period for users to modify or buy equipment to use channel 38’⁸². Whilst we believe that three years would probably be sufficient, the critical point is that the three years would need to start from the point at which channel 38 offers a genuine like-for-like alternative to channel 69. As Ofcom have accepted, until viable replacement options are available, users who need new equipment have no option but to invest in equipment that operates in

⁷⁶ We are aware that Ofcom have already published a study on the potential for interference from mobile terminals in the DDR upper sub-band to PMSE equipment in channel 69, which suggests that no guard-band is necessary. We are concerned that Ofcom will seek to apply the same results to any new spectrum replacing channel 69 because the study was seriously flawed. It considers only the most basic case of a single user equipment (UE) interfering with a single radio microphone (RM) due to bandwidth limitations of both devices. It failed to consider intermodulation products (IP's) due to either (a) two or more UE's mixing together to generate IP's on multiple frequencies within the PMSE band, or (b) one or more UE's mixing with one or more RM's to generate IP's within the PMSE band. Intermodulation is a serious issue for users of radio mics because it is the ultimate governing factor that limits the density of RM use within a given frequency band. The presence of strong adjacent UE signals will greatly limit the number of RM's that can be used within the band. When frequency assignments are made for RM's at any given location, the frequency of each individual RM is carefully calculated to avoid intermodulation interference. It is not possible to take account of UE frequencies in advance because they will not be known in advance and may change continually. In assessing the need for guard-bands, Ofcom must commission a full study taking proper account of intermodulation effects in the presence of multiple adjacent UE's and multiple RM's. This will involve practical tests as well as theoretical ones: BEIRG members would be glad to advise and assist with suitable equipment and locations.

⁷⁷ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.38

⁷⁸ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section

⁷⁹ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.36

⁸⁰ Reasons for this are clearly explained in our responses to the cleared and geographic award consultations

⁸¹ It is worth noting here that Ofcom have added that ‘if DTT emerges as a use of any of channels 31-37 as a result of the cleared award, this could add to the availability of adjacent or nearby interleaved spectrum’. While this may be the case, we do not know what the configuration of that interleaved spectrum will be. Therefore, channel 38 may not lie adjacent to, or even be sufficiently close for existing equipment tuning ranges to exploit, any useable interleaved spectrum in channels 37 or below.

⁸² <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.75

currently-available frequencies. Until channel 38 is available on the same basis and terms as channel 69, users who need new equipment will have no option but to continue to buy channel 69 equipment (channel 38 equipment will not offer the same benefits and hence not provide what users need to do the job). Therefore, the three year transition, as defined by Ofcom as the 'period for users to modify or buy equipment to use channel 38' must not start until channel 38 is available and licensed on the same terms as channel 69 because this will be the point at which users will buy channel 38 equipment. Whilst a three-year transition should be sufficient, it must be defined as the period where channel 38 and channel 69 are available on the same terms at the same time; otherwise, it would not be a transition at all, just time elapsed between notice and termination of access.

10. Temporary PMSE access to cleared spectrum

- 10.1.** We believe that Ofcom's proposal to 'maintain existing PMSE access to the cleared spectrum until DSO is completed in the UK in late 2012'⁸³ is a step forward. We advocated this in our responses to the cleared and geographic interleaved award consultations. However, things have since changed; Ofcom are now proposing to migrate PMSE from channel 69 into channel 38. Therefore, we do not agree that late 2012 should necessarily be the point at which PMSE access to the cleared spectrum, specifically channel 69, ceases. For the reasons explained in point 9.1 above, PMSE should retain access to channel 69 for three years from the point at which channel 38 is available and licensable on the same terms as channel 69 (i.e. three years from the point at which genuine replacement options are available).
- 10.2.** We believe that, under Ofcom's proposals for the implementation options, there is a danger that the cleared spectrum will lie fallow (i.e. unused by new services) after the date that PMSE access to this spectrum formally ceases. As this could create considerable problems for the band manager and the PMSE sector in general, Ofcom must ensure that this is prevented from taking place.
- 10.3.** Under current proposals, temporary PMSE access to the cleared spectrum will continue only until after the Olympics in 2012. However, if the 800 MHz band will not be used for new services until after this date, there will be nothing to prevent the PMSE sector from continuing to access this spectrum. If the 800 MHz band is de facto available for PMSE but not licensable by the band manager, then PMSE users will be able to deploy existing 800 MHz equipment in this spectrum without paying for it (admittedly without the benefits of coordination) when they would otherwise have to access spectrum that is under the band manager's control. As a consequence, the band manager will be unfairly deprived of a significant proportion of its revenue, hence making it more difficult to recoup its licence-fee charges. In addition, de facto allowing the PMSE sector to access spectrum without payment would be counter-productive to Ofcom's declared objective of the AIP-based licence-fee, which is to move the PMSE sector towards accessing spectrum via full market mechanisms by 2018 (at which point, under current proposals, the band manager's obligations to PMSE will cease⁸⁴).
- 10.4.** In view of Ofcom's duty to make efficient use of spectrum and the negative consequences of allowing the 800 MHz band to lie fallow (and unlicensable by the band manager), Ofcom should award the 800 MHz band to the band manager on a temporary basis until the point at which it will be used for new services. If Ofcom did so, then this would inevitably lead to more efficient use of this spectrum, it would increase the band manager's ability to generate revenue and it will further Ofcom's objective of moving the PMSE sector towards market-based spectrum access. Of course, no AIP charge should be applied to spectrum awarded to the band manager on a temporary basis.

11. Impact of new services in channel 69

⁸³ <http://www.ofcom.org.uk/consult/condocs/800mhz/800mhz.pdf> section 5.66

⁸⁴ Please see our response to the band manager consultation for our views on this <http://www2.ofcom.org.uk/consult/condocs/bandmgr/responses/beirg.pdf>

- 11.1.** 863 – 865 MHz is a harmonized EU band (class1 band). OFCOM should ensure that any new services in channel 69 do not interfere into 863 – 865 MHz. Applications that operate in the 863 – 865 MHz band include hearing aids, wireless headphones, touring guide systems and consumer audio applications, all of which must be protected from out-of-band interference.