



**BBC response to Ofcom's consultation: *New Spectrum for Audio PMSE***

**18 December 2015**

## Overview

1. The BBC welcomes Ofcom's consultation 'New Spectrum for Audio PMSE' published on 23 October 2015.
2. Wireless audio equipment is a critical tool in creating high quality productions, and interleaved spectrum between 470 and 790 MHz is the primary band used by programme makers and event producers.
3. The BBC is a significant user of audio PMSE applications holding Wireless Telegraphy Act licences for our own equipment and renting additional equipment from third party providers. The BBC directly holds 288 licences for operation between 694 and 790 MHz (the 700 MHz band) and 491 licences between 470 and 694 MHz. The majority of these licences are used for low power microphones/in ear monitors (IEMs) and talkback.
4. When 700 MHz is cleared to make way for mobile broadband, the loss of spectrum access for PMSE will have a material impact reducing spectrum available for audio PMSE use by at least 30%.<sup>1</sup> It is essential programme makers and events producers can continue to make world class content which is valued by audiences and which drives demand for mobile data consumption<sup>2</sup>. We welcome Ofcom's commitment to ensuring PMSE users will have access to sufficient spectrum to continue delivering citizen and consumer benefits once access to 700 MHz is withdrawn.<sup>3</sup>
5. We also welcome the proposal of additional spectrum between 960 to 1164 MHz (960 MHz) for a PMSE allocation. We believe 960 MHz will be a useful resource for low power PMSE use as long as spectrum is free from interference. Based on Ofcom's extensive work we agree low power PMSE could co-exist with incumbent services for indoor use, and we are planning our own testing to verify the sharing analysis in respect of outdoor use.
6. We are keen to support a proposed solution that will work for the programme making and events sector and would like to engage with Ofcom and with industry at the earliest opportunity to explore whether a transition to 960 MHz could facilitate a move to new digital technologies. This would not negate the need for additional spectrum access when 700 MHz is withdrawn, but it could lead to improvements in spectrum utilisation and sharing.
7. We are already working closely with Ofcom to remediate DTT out of 700 MHz while retaining the public benefits associated with free-to-air television and minimising disruption to viewers. We recognise that use of 700 MHz for mobile broadband is likely to bring benefits to UK citizens and consumers as well as mobile broadband providers. However, Ofcom estimated this change of use would result in PMSE equipment replacement costs of between £13m- £21m in addition to staff training and recruitment costs of £10m-£13m.<sup>4</sup> We would welcome Ofcom

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<sup>1</sup> Ofcom, [Consultation on the future use of the 700 MHz band](#), May 2014.

<sup>2</sup> See for example WIK, [Competition & investment: An analysis of the drivers of investment and consumer welfare in mobile telecommunications](#), July 2015.

<sup>3</sup> Ofcom, [Decision to make the 700 MHz band available for mobile data – statement](#), November 2014.

<sup>4</sup> Ofcom, [Decision to make the 700 MHz band available for mobile data – statement](#), November 2014.

further consulting on the implications of 700 MHz clearance for PMSE in 2016 and assume that these issues of costs and benefits will be further looked at then.

8. As a significant user of audio PMSE spectrum, the BBC has a material interest not only in the solution to address the lack of available spectrum for audio PMSE post-700 MHz clearance, but also in making sure this solution is workable in practice.
9. Ofcom's in-depth analysis and commitment to ensuring that PMSE users will have access to sufficient spectrum once access to the 700 MHz band is withdrawn is reassuring.<sup>5</sup> Nevertheless, for users there is continued uncertainty related to the availability of 960 MHz equipment by the start of 700 MHz clearance and availability of spectrum for high power PMSE use at events with high demand for spectrum access. After manufacturers' plans and DTT re-planning has progressed we would therefore encourage Ofcom to review and set out:
  - i. the availability of spectrum for PMSE use; and the
  - ii. timing of PMSE channel clearance.
10. This would provide helpful guidance to PMSE users to assist with planning and equipment replacement. This would better enable analysis of spectrum availability for peak demand events while the clearance process is underway. And, in the event a shortfall was identified, this would also provide time to identify further mitigations. For example, to meet a temporary shortfall Ofcom might facilitate further spectrum 'loans' in appropriate bands.
11. We set out more detailed comments below in response to the specific questions raised in the consultation.

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<sup>5</sup> Ofcom, [Decision to make the 700 MHz band available for mobile data – statement](#), November 2014.(Paragraph 7.2.3)

## Answers to questions in Ofcom's consultation: New Spectrum for Audio PMSE

*Question 1: Do you agree with our assessment that minimal growth in demand and stability in spectrum supply means that we do not need to implement any changes to meet the ongoing requirements for talkback, audio links and telemetry and telecommand applications?*

12. Broadly we agree with Ofcom's assessment. We note however that Ofcom's assessment is dependent on access to 'loan' spectrum (as set out in paragraphs 3.8 and 3.9). We would therefore expect that any change to the availability of this loan spectrum would result in a re-assessment of audio PMSE supply and demand especially for peak demand events.

*Question 2: Do you agree with our sharing analysis which concludes that audio PMSE (low power microphones and IEMs) could co-exist with incumbent services in the bands 960 to 1164 MHz and 1525 to 1559 MHz? If not, please provide specific details/evidence to illustrate your view.*

13. We welcome identification of additional spectrum for audio PMSE and the dedication of Ofcom's PMSE team to finding long term spectrum solutions for programme makers. Subject to the caveats set out below we consider 960 MHz has the potential to be a useful resource for low power audio use.

### *Availability and quality of spectrum for low power use in 960 to 1164 MHz*

14. For *indoor* operation we agree low power microphones and IEMs could co-exist with incumbent services in 960 to 1164 MHz based on the information set out in Ofcom's sharing analysis.
15. For *outdoor* operation, however, we do have some concerns about co-existence. In particular we have concerns about sharing with incumbent radar systems which raise the risk of interference to PMSE users. In the past we have experienced performance degradation of audio links operating in 446 MHz in close geographic proximity to radar operations. This led to the BBC ceasing use of 446 MHz and moving operations to alternative spectrum. We will therefore undertake additional practical testing to verify the availability of 'clean' spectrum in 960 MHz building on Ofcom's work. We plan to undertake this work in early 2016, prior to making a decision to invest in equipment in the band, and would be keen to collaborate with Ofcom and share our findings.
16. We also note the potential for new systems to be introduced in the band (paragraphs 4.26 and 4.27). Ofcom's estimate (paragraph 4.42) that the introduction of LDACS could reduce the available spectrum by just 10 MHz is reassuring, but we would welcome further assurances from Ofcom in respect of the long term availability of 960 MHz spectrum.

### *Availability and quality of spectrum for low power use in 1525 to 1559 MHz*

17. In respect of 1525 to 1559 MHz we note Ofcom are not planning to make the band available at this time after assessing that 960 to 1164 MHz offers greater potential for long term PMSE access.

*Question 3: Do you have any comments on our proposal to allow low power audio PMSE applications (wireless microphones and IEMs) access to the 960-1164 MHz band?*

18. We welcome the identification of at least 42 MHz of spectrum above 960 MHz for low power use. The BBC is keen to work with Ofcom and industry so that the opportunity to access 960 MHz is maximised for PMSE users. In doing so we are keen to support efforts to make equipment available in time for the band to function as a mitigation for loss of spectrum in 700 MHz. We set out opportunities and issues for further consideration below.

*The BBC is a significant audio PMSE user*

19. PMSE use of 470 to 790 MHz is critical to the provision of wireless audio services to BBC broadcasting productions. The loss of spectrum access for PMSE will have a material impact reducing spectrum available for audio PMSE use by at least 30%.<sup>6</sup> Today this band is significantly important for site specific fixed installations such as studio talkback equipment and for site specific roaming equipment such as radio microphones and in-ear monitors, many of which are owned by the BBC and are currently using spectrum which will be vacated as part of 700 MHz clearance. The BBC directly holds 288 licences for operation between 694 and 790 MHz (the 700 MHz band) and 491 licences between 470 and 694 MHz. As a heavy user of audio PMSE spectrum we have a material interest in the solutions to address the lack of available spectrum for audio PMSE post-700 MHz clearance.

*Working with Ofcom and industry to make the most of future opportunities*

20. The proposal to allow low power PMSE applications access to 960 to 1164 MHz is an opportunity to develop alternate digital modulation methods to the commonly used frequency modulation in 200kHz channels currently in widespread use. High audio quality and very low latency are key requirements and the BBC is ready to work collaboratively with the wider industry to develop standards for modulation that could lead to better utilisation and sharing of the band. Such work should not however hold up other equipment being deployed. For example, existing designs previously used in channels 69 and 70 with adjustment might be able to operate in the band. We would be keen to work with Ofcom and/or industry to help realise these opportunities.

*Potential mitigation for loss of 700 MHz?*

21. Ofcom has provided reassurances in previous statements that conclusion of the PMSE Review in 2015 would "allow sufficient time for manufacturers to develop and bring to market equipment" before change of use of 700 MHz.<sup>7</sup> Nevertheless, the timescales for availability of 960 MHz equipment is uncertain and at the same time the date for 700 MHz clearance is being brought forward.
22. Currently the BBC is working with Ofcom and stakeholders on the spectrum planning group to replan DTT spectrum. 700 MHz spectrum may be cleared of PMSE uses as early as 2019 (paragraph 5.7), but achieving clearance by 2019 rather than 2021/2, may result in a requirement for temporary 'parking' channels for some multiplexes. Additionally, identifying channel allocations for Local TV is still ongoing and detailed relay-station frequency planning will also

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<sup>6</sup> Ofcom, [Consultation on the future use of the 700 MHz band](#), May 2014.

<sup>7</sup> Ofcom, [Decision to make the 700 MHz band available for mobile data – statement](#), November 2014. (Paragraph 7.26.2)

need to take place. Only on completion of these work plans can the availability of spectrum left for audio PMSE throughout the timeline of the clearance project be determined.

23. Procurement and deployment of new equipment to operate in alternative spectrum bands is not something that can be implemented in a short time frame without major capital investment. Equipment lifecycles are typically 15 years.<sup>8</sup> Replacement equipment should be planned as a seamless transition through lifecycle replacement and would therefore start as soon as is practically possible, ideally to be completed before spectrum is required to be released in that location.
24. The timing of mitigation band availability has an impact on:
- equipment in both the 700 MHz and 470 to 694 MHz bands<sup>9</sup> which needs to be replaced before 960 MHz becomes available for example due to breakage; as well as
  - 700 MHz equipment that will need to be replaced at the time of clearance.

#### *Pre-clearance equipment replacement*

25. 960 MHz equipment is not yet on the market and it is likely to be at least a year, perhaps several, before it is available. We note when PMSE was moved from channel 69 to channel 38, this was accommodated by existing equipment so was available within a year or so. If 960 to 1164 MHz can utilise existing designs (for example, for equipment operating in channel 69 and 70) a year or so may be possible. However, launching new digital system in the band will require design and development and then manufacturing which arguably would take three years at a minimum. Ofcom have previously recognised that stakeholders will not be able to avoid buying equipment which might be affected by the release of 700 MHz until the post clearance configuration of interleaved spectrum below 694 MHz is known (i.e. when the DTT frequency plan is finalised) and/or until equipment which operates in the mitigation band is available.<sup>10</sup>

#### *Replacement at time of clearance*

26. When the clearance process begins, there will be increasing pressures on remaining spectrum for PMSE. If 960 MHz equipment is not available by this time, work may be necessary to determine how audio PMSE demand can be met in the interim period. That is the interim period between the date of clearance of audio PMSE users<sup>11</sup> to the date equipment in 960 MHz (or alternative bands) is available.

#### *Availability of spectrum for high power microphones in 470 to 694 MHz*

27. While we have not experienced problems obtaining allocations at high demand events such as the Golf Open to date, the sheer number of high power radio mics in use already makes it difficult to get clean reception resulting in poor quality spectrum with links either dropping out,

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<sup>8</sup> Ofcom has assumed an asset life of 10 years based on survey data of 28% of equipment surveyed and based analysis for 700 MHz PMSE equipment on 10 to 15 year range.

<http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/summary/main.pdf>

<sup>9</sup> As Ofcom set out in its 'Consultation on the future use of the 700 MHz band', Change of use of the 700 MHz band will affect spectrum availability in two ways. Through (i) the direct loss of the 700 MHz band itself; and (ii) the consequential loss of available spectrum as a result of a replanned DTT network in the frequencies from 470 to 694 MHz.

<sup>10</sup> The BBC deploys equipment with extended tuning ranges where it is necessary and when the additional cost of such equipment can be justified.

<sup>11</sup> This will include not just the 700 MHz (694 to 790 MHz) band, but also areas below 694 MHz.

or becoming distorted. On more than one occasion during the Golf Open we have had to abandon the audio link due to interference, missing a key moment of the action.

28. We do not see the demand for high power microphones decreasing.<sup>12</sup> Depending on the outcome of DTT replanning there is the potential for a lack of available spectrum for high power PMSE use in 470 to 694 MHz post-clearance. We note Ofcom have previously highlighted that in some areas the amount of usable spectrum will be less in practice than in theory depending on the configuration of the broadcast network.<sup>13</sup> This risk is heightened if 700 MHz users remediate into 470 to 694 MHz because equipment isn't available in mitigation bands. In the worst case scenario this could lead to negative impact on production quality and 'diminished audience experience'.
29. We would therefore urge Ofcom to set out a refreshed view of spectrum availability and a clear transition plan for audio PMSE users after DTT re-planning has been completed and when the timescales for availability of 960 MHz equipment is known. This would provide helpful guidance to PMSE users to assist with planning and equipment replacement. It would better enable analysis of spectrum availability for peak demand events while the clearance process is underway. And, in the event shortfalls were identified, it would also provide time to identify further mitigations.

**ENDS.**

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<sup>12</sup> Ofcom, [Consultation on the future use of the 700 MHz band](#), May 2014.

<sup>13</sup> Ofcom, [Consultation on the future use of the 700 MHz band](#), May 2014. (Paragraph 7.22)