

## Your response

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<p><b>Section 3 –Spectrum use by the PMSE sector in the UK</b></p> <p><b>Question 1:</b> What are your views on how our processes work - for example our online booking system, turn-around times, and event coordination. Do you think the current approach works well? How could we improve it?</p>	<p>Confidential? – Y / N</p> <p>Not used.</p>
<p><b>Section 4 – PMSE historic trends</b></p> <p><b>Question 2:</b> Do you have any comments on how we have analysed and characterised wireless microphone and IEM demand, or suggestions for alternative ways of characterising this demand?</p>	<p>Confidential? – Y / N</p> <p>I expect that there's a lot of usage going on which is 'under the radar' – people using Ch38 without a licence and people buying US frequency stuff without realising.</p>
<p><b>Question 3:</b> Do you have any comments on how we have analysed and characterised wireless video demand, or suggestions for alternative ways of characterising wireless video demand?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>

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<p><b>Section 5 – Future trends and opportunities</b></p> <p><b>Wireless audio</b></p> <p><b>Drivers of demand</b></p> <p><b>Question 4:</b> What factors have driven changes in the demand for audio PMSE applications, specifically for:</p> <ul style="list-style-type: none"> <li>a) the increased use of coordinated wireless microphones and IEMs, particularly the peak number of simultaneous assignments used at the largest events?</li> <li>b) the slight decline in the number of national wireless microphone licences (UHF channel 38 and VHF)? Has the extent of use of these licences changed, and if so why?</li> <li>c) the declines in talkback, fixed audio links and ADS licences?</li> </ul>	<p>Confidential? – Y / N</p> <p>(a) – N/A</p> <p>(b) – As wireless performance aids (guitar links, cheap IEMs etc.) have become more widely available and more reliable (e.g. 5GHz IEMs with channel hopping), VHF systems are increasingly outdated and less visible to buy.</p> <p>I suspect Ch38 has reduced a little across the board because people don't know/care and use USA frequency stuff (500MHz) or are top pros for festivals etc. and can get specific allocations.</p> <p>For me, CH38 is very important because it gives me largely clear frequencies for SEMI PRO work – small festivals, large clubs and weddings.</p> <p>(b) N/A</p>
<p><b>Question 5:</b> What factors could drive further changes in the demand for audio PMSE applications in the future, and what will this mean for future demand, specifically for:</p> <ul style="list-style-type: none"> <li>a) coordinated wireless microphones and IEMs, particularly the peak number of simultaneous assignments used at the largest events?</li> <li>b) national wireless microphone licences (UHF channel 38 and VHF)?</li> </ul>	<p>Confidential? – Y / N</p> <p>(a) probably but it's not an area I have any specific knowledge of</p> <p>(b) There's a difference between 'usage' and PMSE applications. I'd be surprised if more than 5% of Ch38 usage is covered by a PMSE licence.</p> <p>RF in live sound is not well understood unless you're a big provider or a careful semi-pro like me.</p> <p>Not enforcing licences makes people relax and not bother. I hear people say "what's the point – they never do anything about it". Make the licence a token payment (e.g. £20) and you'll find a different story and have better data to work with.</p>

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c) talkback, fixed audio links and ADS licences?	(c) – N/A
<p><b>Question 6:</b> Do you agree that, given the trends, we are right to focus on wireless microphones/IEMs?</p>	<p>Confidential? – Y / N</p> <p>Yes but in an enabling manner. People’s investment is high (mine is equivalent to 1 year turnover) and expect their kit to last for 8 years +. Changing frequencies would stimey that, especially if compensation is difficult or insufficient.</p>
<p><b>Changes in the take-up of bands already available</b></p> <p><b>Question 7:</b> What factors have driven the take-up of different bands for wireless audio? What are the barriers to greater use of the DME band?</p>	<p>Confidential? – Y / N</p> <p>It’s a confusing landscape. Audio people are usually not also RF people. 2.4GHz, 5Ghz, Ch70, Ch38, 1.8GHz, digital, analogue, VHF, etc etc. Each have merits and drawbacks, price premiums etc. and vendors make their kit for Europe and the US too. So some of the lesser used bands may not be visible when buying.</p>
<p><b>Question 8:</b> What actions could enable greater take-up of the DME, DECT and licence exempt bands in the future?</p>	<p>Confidential? – Y / N</p> <p>Wider tuning bandwidths and compatibility with US and European standards.</p>
<p><b>Changes in spectrum availability</b></p> <p><b>Question 9:</b> Which potential additional bands might be suitable for wireless audio applications, particularly microphones and IEMs at the largest events and venues?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 10:</b> To what extent do the characteristics of different audio applications drive their requirements for spectrum – for example particular requirements for latency, resilience or capacity?</p>	<p>Confidential? – Y / N</p> <p>To a medium extent. I don’t think latency is a big factor (at least in the semi pro realm). But reliability certainly is. Drop outs, pops and fizzes are a very audible and frustrating feature of tight frequency bandwidth and low power systems. Capacity is a factor but with ~10 channels in Ch38 PLUS some Ch70 and some 5GHZ, a mid size show can run without too many issues if care is taken.</p>

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<p><b>Changes in efficiency of spectrum use</b></p> <p><b>Question 11:</b> What changes in spectrum use (technology, working practices, different bands, etc) have enabled audio wireless growth to be accommodated to date, particularly the increased use of wireless microphones and IEMs at the largest events and venues in the context of reduced UHF spectrum availability?</p>	<p>Confidential? – Y / N</p> <p>Digital technology (e.g. Sennheiser’s 600KHz channel spacing on their EW-D kit).</p>
<p><b>Question 12:</b> What technologies are currently available or are being developed which can improve audio spectrum efficiency in the future, particularly in the use of wireless microphones and IEMs at the largest events and venues?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 13:</b> Are there any barriers to adopting more efficient technologies for audio applications, particularly for wireless microphones and IEMs at the largest events and venues? What could industry do and what could Ofcom do to facilitate greater use of those technologies?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 14:</b> What changes to working practices and spectrum planning could improve audio spectrum efficiency in the future, particularly in the use of wireless microphones and IEMs at the largest events and venues?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 15:</b> Are there any barriers to adopting working practices that could enable more efficient use of spectrum by audio applications, particularly for wireless microphones and IEMs at the largest events and venues? What could industry do and what could</p>	<p>Confidential? – Y / N</p> <p>N/A</p>

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Ofcom do to facilitate those efficiencies?	
<p><b>Wireless video</b></p> <p><b>Drivers of demand</b></p> <p><b>Question 16:</b> What factors (such as more complex events and use of higher resolution equipment) have driven the demand for wireless video bandwidth, in particular for:</p> <ul style="list-style-type: none"> <li>a) the increased bandwidth required for the largest sporting events such as Formula 1 at Silverstone and The Open Championship?</li> <li>b) the bandwidth required for nationally important state events such as The Coronation?</li> <li>c) the slow growth or decline in bandwidth used at horse racing fixtures?</li> </ul>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 17:</b> What factors could drive further changes in the demand for wireless video bandwidth in the future, and what will this mean for future demand, in particular for:</p> <ul style="list-style-type: none"> <li>a) the bandwidth required for the largest sporting events like Formula 1 at Silverstone and The Open Championship?</li> <li>b) the bandwidth required for nationally important state events such as The Coronation?</li> </ul>	<p>Confidential? – Y / N</p> <p>N/A</p>

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c) the bandwidth used at horse racing fixtures and other major sporting events?	
<p><b>Potential news bands</b></p> <p><b>Question 18:</b> What factors have influenced the degree of take-up of existing bands used by wireless video applications, particularly the growth in take-up of the 7 GHz band?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 19:</b> Which potential additional bands might be suitable for video PMSE applications, particularly at the largest events and venues?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 20:</b> To what extent do the characteristics of different video applications drive their requirements for spectrum – for example particular requirements for resilience or capacity?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Changes in efficiency of spectrum use</b></p> <p><b>Question 21:</b> What technologies are currently available or are being developed which can improve wireless video spectrum efficiency in the future?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 22:</b> Are there any barriers to adopting more efficient technologies for wireless video? What could industry do and what could Ofcom do to facilitate greater use of those technologies?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>
<p><b>Question 23:</b> What types of video demand could realistically be supported by private (for example 5G) networks?</p>	<p>Confidential? – Y / N</p> <p>N/A</p>

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<b>Question 24:</b> What changes to working practices and spectrum planning could improve video spectrum efficiency in the future, particularly in the use of wireless microphones and IEMs at the largest events and venues?	Confidential? – Y / N  N/A
<b>Question 25:</b> Are there any barriers to adopting working practices that could enable more efficient use of spectrum by wireless video? What could industry do and what could Ofcom do to facilitate those efficiencies?	Confidential? – Y / N  N/A
<b>Other comments</b>  <b>Question 26:</b> Do you have any other comments or views on the issues raised in this document?	Confidential? – Y / N  N/A

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- Other (please specify)

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