

Your response

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<p>Section 3 –Spectrum use by the PMSE sector in the UK</p> <p>Question 1: 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>That the online booking system exists is great, and I certainly missed it when the website went down late last year! The website itself is often very slow, and doesn't offer an easy solution for booking multiple channels at multiple locations throughout a tour for example – but nevertheless very useful and world leading</p>
<p>Section 4 – PMSE historic trends</p> <p>Question 2: 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>No major concerns with the analysis. From a venue perspective, the data broadly reflects what we see – the trend towards higher channel counts at the top end is consistent with the increasing complexity of productions we host.</p>
<p>Question 3: 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>No specific comments – wireless video is primarily the domain of the outside broadcast companies that cover our events rather than something we manage in-house.</p>

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<p>Section 5 – Future trends and opportunities</p> <p>Wireless audio</p> <p>Drivers of demand</p> <p>Question 4: What factors have driven changes in the demand for audio PMSE applications, specifically for:</p> <ul style="list-style-type: none"> a) the increased use of coordinated wireless microphones and IEMs, particularly the peak number of simultaneous assignments used at the largest events? 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? c) the declines in talkback, fixed audio links and ADS licences? 	<p>Confidential? – Y / N</p> <p>For us it's primarily content driven – shows are becoming increasingly ambitious with greater quantities of guest performers, multi-act shows, off-stage performance locations etc. which are only achievable with RF. As a venue with multiple performance spaces, this becomes more challenging when having to coordinate with events in nearby locations.</p> <p>We've never/very rarely used ch38</p>
<p>Question 5: 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"> a) coordinated wireless microphones and IEMs, particularly the peak number of simultaneous assignments used at the largest events? b) national wireless microphone licences (UHF channel 38 and VHF)? 	<p>Confidential? – Y / N</p> <p>Basically a continuation of the above response. Higher technical standards, increased audience expectations.</p> <p>b) likely to result in greater usage of ch38</p>

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<p>c) talkback, fixed audio links and ADS licences?</p>	
<p>Question 6: Do you agree that, given the trends, we are right to focus on wireless microphones/IEMs?</p>	<p>Confidential? – Y / N Yes</p>
<p>Changes in the take-up of bands already available</p> <p>Question 7: 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>The 700MHz sell-off, which in my experience has primarily resulted in increased usage of 490-600MHz. Regarding barriers to greater use of the DME band – beyond the greater propagation loss, there is a limited supply of equipment operating in that band as well as the obvious financial barrier to purchasing replacement equipment.</p>
<p>Question 8: 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>Fundamentally I don't think these bands are appropriate for a lot of PMSE content. A big reason is the additional propagation loss at higher frequencies. Our wireless communications system already operates in DECT and given it's a relatively small band, I have reservations about trying to run wireless microphones & IEMs on top of this.</p>
<p>Changes in spectrum availability</p> <p>Question 9: 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>Potentially the higher end of VHF, but to be honest UHF is irreplaceable.</p>
<p>Question 10: 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>There is a significant trend, particularly among newer artists, of relying heavily on show critical IEM systems – and these systems are particularly sensitive to latency. We also have a lot of skin in this game, as due to the challenging acoustics of our venue, we have to keep stage noise to a minimum – and the best way of doing</p>

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	<p>this is replacing wedge monitors with IEMs. While digital RF transmission is a big improvement in terms of coordination, significant consideration must be paid to total roundtrip latency and certain combinations of system can render them effectively useless. For example – digital radio mic latency + processing latency + digital IEM latency can easily add up to 10ms, and a lot of performers will be adversely affected by anything upwards of 5ms.</p>
<p>Changes in efficiency of spectrum use</p> <p>Question 11: 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 transmission – in our case, Shure Axient Digital, ADPSM & Sennheiser Spectera. However, there are still many acts who will not consider digital IEM due to the latency implications. Some have resorted to using entirely analogue infrastructure before hitting the transmitter to try and mitigate this</p>
<p>Question 12: 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>WMAS has potential but often less spectrally efficient than advertised and latency is influenced by channel count</p>
<p>Question 13: 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>Financial, primarily. The cost of replacing established analogue systems with digital alternatives is significant, and there's an element of risk given that these technologies are still maturing</p>
<p>Question 14: 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>Honestly I think the industry already works at capacity, particularly on larger events, and we are already operating as efficiently as possible.</p>

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<p>Question 15: 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 Ofcom do to facilitate those efficiencies?</p>	<p>Confidential? – Y / N</p> <p>We do use RF in multiple spaces around the building, but they use cheaper/older hardware which is already operating at it's most efficient</p>
<p>Wireless video</p> <p>Drivers of demand</p> <p>Question 16: 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"> a) the increased bandwidth required for the largest sporting events such as Formula 1 at Silverstone and The Open Championship? b) the bandwidth required for nationally important state events such as The Coronation? c) the slow growth or decline in bandwidth used at horse racing fixtures? 	<p>Confidential? – Y / N</p> <p>We don't have a huge amount of direct involvement in wireless video – our broadcast events are primarily managed by the OB companies. That said, the general trend towards more camera positions and higher resolution requirements at major events is consistent with what we observe from our end.</p>
<p>Question 17: 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"> a) the bandwidth required for the largest sporting events like Formula 1 at Silverstone and The Open Championship? 	<p>Confidential? – Y / N</p> <p>Content/audience expectation driven</p>

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<p>b) the bandwidth required for nationally important state events such as The Coronation?</p> <p>c) the bandwidth used at horse racing fixtures and other major sporting events?</p>	
<p>Potential news bands</p> <p>Question 18: 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>Not something we have direct visibility on from a venue perspective – would defer to the OB companies on this.</p>
<p>Question 19: 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>Question 20: 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>Changes in efficiency of spectrum use</p> <p>Question 21: 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>Not our area of direct expertise. We're aware of developments in HEVC/H.265 and newer codecs improving bandwidth efficiency, but would defer to the OB sector for specifics.</p>
<p>Question 22: 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>

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<p>Question 23: What types of video demand could realistically be supported by private (for example 5G) networks?</p>	<p>Confidential? – Y / N</p>
<p>Question 24: 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?</p>	<p>Confidential? – Y / N</p> <p>Not something we're directly involved in from a venue perspective.</p>
<p>Question 25: 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?</p>	<p>Confidential? – Y / N</p> <p>As above – this is primarily OB company territory for us. The main thing we can do from a venue side is ensure good coordination and communication with the broadcast teams regarding spectrum usage across the building.</p>
<p>Other comments</p> <p>Question 26: Do you have any other comments or views on the issues raised in this document?</p>	<p>Confidential? – Y / N</p> <p>The PMSE sector is already under significant pressure from spectrum reallocation. Any further reduction in UHF availability would have a genuinely damaging impact on the quality and ambition of live events in the UK. The Royal Albert Hall hosts over 400 events a year across multiple spaces and wireless spectrum is fundamental to delivering these to the standard expected by audiences and artists alike. I'd also flag that the consultation could benefit from more direct engagement with major venues – we sit at the intersection of all of these issues and have a unique perspective on how spectrum pressures play out in practice.</p>

Please tell us how you came across about this consultation.

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