

Your response

| Question | 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? – N – We frequently use the online booking tool, and it is invaluable, especially for last minute changes and additions. However, the interface is clunky, and we have concerns around the shutdown in 2024, and how it was communicated, especially the length of the outage. But that is not to take away from how useful a tool it is. Email responses are quickly dealt with. It would be good to see a greater presence at some co-ordinated events, addressing our concerns, as well as other spectrum stakeholders.....</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? – N – The characterisation is good. There has been an increase in demand for ‘in the action’ coverage, on the pitch at football matches for example, that can only be delivered with RF, and this is reflected in the data. Also the increase of certain LE type shows with multiple contestants, often into the hundreds, which can be challenging to co-ordinate, but with support can be delivered.</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? – N – Given the increasing spectrum demands, rather than just selling 10MHz slots, 5MHz, 8MHz, 16MHz or 20MHz slots might be useful – especially for larger events. This could complicate things for the majority of users, but most wireless video equipment is happy working on adjacent channels, and squeezing in an extra system is often useful. And more confident system users are usually able to self manage in this regard.</p> <p>With further reviews on 2GHz use (satellite to phone use), if not careful – we could end up with no viable spectrum for PMSE video usage.</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? – N –</p> <p>a) There are a few threads to this, considering live concert type events, and live sports events. For live concerts, more performers and greater use of IEMs has driven demand, and at larger festivals this is particularly noticeable.</p> <p>At larger sporting events, there has been an increasing trend to be part of the action, pieces on the football pitch are commonplace, and also multiple presentation locations within a stadium to help soak up the atmosphere all require more elaborate deployments and frequency management to deliver.</p> <p>b) As facilities providers at larger events, we prefer to avoid the shared channel 38, as we need the certainty that our equipment will be free from interference. Often at these events, there can be hospitality/event/stadium services using this spectrum, and we prefer the reassurance of knowing we should be alone within our space.</p> <p>c) We have no experience of using fixed audio links or ADS licences, so are unable to comment here....</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? – N</p> <ul style="list-style-type: none"> a) multiple rights holders at larger events could drive an increase in demand. Typically it is only the largest events that have multiple rights holders on site, but greater demand for an onsite presence could result in a greater demand for spectrum at specific locations. Coupled with the enhanced coverage increasingly becoming more commonplace at such events, this could become challenging. It can already be difficult to obtain the required spectrum at some larger football matches (especially in the West Midlands and Liverpool), so this could clearly become more challenging in future. |

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| <p>c) talkback, fixed audio links and ADS licences?</p> | <p>b) Again, if more rights holders appear on site, this may result in more demand for ch 38 as a last resort from ad hoc facilities. Which of course would further discourage users like ourselves from wanting to occupy that spectrum.</p> |
| <p>Question 6: Do you agree that, given the trends, we are right to focus on wireless microphones/IEMs?</p> | <p>Confidential? – N Yes indeed, given the increase in demand for their usage at all types of events from sport to concerts and LE/reality programmes</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? – N</p> <p>Uncertainty over future spectrum availability has been a handbrake on investing in new equipment, as well as the financial situation in the industry over the last few years, there has been little scope for investment, and more focus on consolidation and making better use of existing resources. This includes access to the DME band, as our current equipment will not operate in that range.</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? – N Certainty around long term spectrum availability. We would not wish to invest in equipment that rapidly becomes obsolete. Also, wider availability of mature solutions. Some of the newer technology still doesn't meet our needs, and while potentially of interest, we wouldn't want to invest in new technology before we are confident in it being capable of it meeting our current use cases. Also, we have serious concerns about using licence exempt bands. From our experiences with Bolero, we can often encounter unexplained interference with little or no time to resolve it. This is bad enough with communications equipment, but if was also the radio mics for presentation, it would seriously inhibit our ability to deliver our show. We prefer the certainty of an assigned managed spectrum.</p> |

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| <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? – N – As with previous answers, certainty around long term availability is paramount. The need to see a sustained long term return from any investment in new equipment, would mean a reluctance to invest in new equipment. The spectrum would need to be widely available outside of the largest events to ensure the equipment would be regularly used.</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? – N – Latency is paramount with audio equipment, and delay introduced can have a serious effect on the ability to communicate, and can also impact our ability to deliver synchronous audio and video, as per our clients expectations. Digital systems inherently introduce delay, and while technology is constantly reducing this, any latency in audio systems needs to be kept to an absolute minimum. Resilience is also key, as the equipment can often be stretched to the limits of its capabilities. Analogue equipment is generally more forgiving under such usage than digital. While digital equipment may offer benefits in terms of capacity, the trade off can often be around resilience and latency.</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? – N - Generally better spectrum management has been the most significant change, making use of geographical separation on larger event sites such as Glastonbury, or sensible planning on more confined locations. Many large productions are already operating at the limits of possibility, in terms of spectrum and equipment usage. While WMAS may offer the ability to cram more channels into a smaller space, the compromise inherent in this denser utilisation is as yet unclear and to our eyes, unproven. Reduced spectrum availability will limit the ability to deliver the premium facilities at large scale events in their current format, as expected by the audiences both on site and at home.</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? – N – As already suggested, WMAS systems show the potential to optimise spectrum usage, but the implications of higher channel counts are as yet unknown, with regards to quality, latency and range performance. Only time will tell if they are the answer to the problem, but the technology still needs to mature somewhat before it is widely adopted.</p> |

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| <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? – N – Funding is an issue. In the current economic climate, spending that is non recoverable is not always an option, as spend will need to be amortised, and in an ideal world, any additional spend would need to be charged on to the end client. Hence, unless a client specifically requests new technology, it is unlikely to be introduced. Technology also needs to be proven before adoption, so until there is a greater availability of newer technologies (WMAS for one) for appraisal in real life situations (ie on actual events, rather than just demos) take up will likely be slow.</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? – N - Large productions already operate with Professional spectrum co-ordinators, advance planning with dynamic reuse and onsite cooperation.</p> <p>Further improvements will likely be minimal, and refinements of this nature are no substitute for loss of usable spectrum.</p> |
| <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? – N - Barriers include the cost of replacing equipment, not least due to current worldwide economic conditions.... The need for international compatibility for touring acts to use the same equipment across multiple territories or specific performer equipment requests. Regulatory uncertainty around frequency availability will also limit the willingness to invest in new equipment, no one wants to buy equipment that will soon become obsolete.</p> <p>Ofcom can assist by could help by providing long-term certainty over UHF and DME availability, supporting international harmonisation, and also by increasing on-site presence at major events</p> <p>Additionally, supporting manufacturer engagement and education could help encourage change.</p> |

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| <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? – N - Wireless cameras have transitioned from niche occasional use tools to core production infrastructure.</p> <p>Drivers include: Improved picture resolution, higher frame rates, lack of cabling reducing health and safety issues, mobility of operation for ‘closer to the action’ coverage</p> <p>Formula 1 and The Open Championship reflect growth in sport popularity and global media value.</p> <p>State events (e.g., The Coronation) demand maximum resilience, redundancy and coverage density.</p> <p>Horse racing bandwidth reflects stable production models and tighter commercial budgets.</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? b) the bandwidth required for nationally important state events such as The Coronation? c) the bandwidth used at horse racing fixtures and other major sporting events? | <p>Confidential? – N - Future demand is likely to increase due to increased adoption of specialist cameras, such as UAVs, body worn cameras etc, and other unique production elements.</p> <p>There is no realistic scenario where production standards regress, once trialled these developments quickly become the expected norm.</p> |

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| <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? – N - 7 GHz growth has been directly influenced by Ofcom policy positioning it as the preferred band for wireless video PMSE.</p> <p>Assignment growth in 7 GHz has been substantial, reflecting real operational reliance.</p> <p>However, WRC-27 Agenda Item 1.7 introduces uncertainty over 7 GHz availability.</p> <p>This creates significant investment risk.</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? – N - Ofcom has indicated this should consider <i>new</i> bands.</p> <p>While manufacturers can adapt, higher frequency bands can have inferior propagation, require higher infrastructure density, can increase deployment cost, increase power and antenna complexity, and along with it engineering burden, requiring expertise that may not be readily available.</p> <p>Development cycles are long. Clear medium- and long-term regulatory commitment would be required before industry invests.</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? – N - Video PMSE requires ultra-low latency, high reliability, and deterministic performance. It also needs sufficient bandwidth for broadcast quality, and stable, protected access.</p> <p>Unlike some mobile broadband applications, video PMSE is mission-critical and intolerant of interference</p> |

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| <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? – N - Incremental improvements could include improved modulation schemes, HEVC and next-generation codecs, more spectrally efficient link budgets and also Bi-directional data integration</p> <p>However, these improvements are evolutionary rather than transformational.</p> <p>There is no “silver bullet” technology that replaces the need for sufficient dedicated spectrum</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? – N - Barriers include equipment replacement cost, client budget constraints and long capital cycles. Regulatory uncertainty and international compatibility requirements can also complicate matters</p> <p>Industry can invest — but only with spectrum certainty.</p> <p>Ofcom can support by protecting 2 GHz and 7 GHz from IMT encroachment, and providing clarity on long-term access</p> <p>Supporting UK positions at WRC</p> |
| <p>Question 23: What types of video demand could realistically be supported by private (for example 5G) networks?</p> | <p>Confidential? – N</p> <p>Private 5G may support, non-critical video assist, data return paths and some ENG applications</p> <p>However, it cannot currently replace high-quality broadcast RF camera links or ultra-low latency live production links</p> <p>Non-broadcast applications. Security and defence, where inconsistent connection may occasionally be acceptable</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? – N</p> <p>Video spectrum is already carefully managed, it is not used as the first port of call, cabled cameras are used wherever practical.</p> <p>Spectrum reuse planning, cross-provider coordination and daily release of annual assignments where possible would all help matters.</p> <p>Further efficiency gains will be incremental.</p> <p>Working practice changes cannot compensate for substantial spectrum loss.</p> |

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| <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? – N - Barriers include capital investment, equipment maturity, international harmonisation and physical propagation limits of certain technologies.</p> <p>Ofcom support through regulatory certainty is critical.</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? – N - The PMSE sector provides a major contribution to national cultural life, enhancing coverage of many major Sporting, Entertainment or State Ceremonial events for those at home unable to attend in person.</p> <p>It operates in the public interest, forming part of our country's cultural make up</p> <p>Current uncertainty arises from:</p> <p>Potential DTT reconfiguration and UHF reallocation, WRC-27 agenda items affecting 2 GHz and 7 GHz, and increasing IMT pressures.</p> <p>The sector has already absorbed 800 MHz clearance, 700 MHz clearance and migration from 2 GHz to 7 GHz</p> <p>Repeated forced migrations increase costs, reduce efficiency and introduce investment risk.</p> <p>Spectrum policy should recognise PMSE as critical national infrastructure, and provide long-term regulatory certainty. Protect UHF, 2 GHz and 7 GHz access and avoid further cumulative erosion across multiple bands</p> <p>The UK's creative industries are globally competitive. Their ability to deliver world-class content depends directly on secure access to appropriate RF spectrum.</p> |

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