RESPONSE OF SHURE INCORPORATED

Securing Long Term Benefits from Scarce Spectrum Resources: A Strategy for UHF Bands IV and V

Submitted June 7, 2012

1. Executive Summary

Introduction

For nearly 90 years, Shure has been a respected U.S. manufacturer of high-quality, innovative Programme Making and Special Events (PMSE) audio products. Today, Shure is a global leader in audio electronics, including particularly wireless microphones used in a wide range of PMSE applications in the professional audio industry as well as in high-quality consumer applications.[1] Headquartered in the United States, Shure maintains research and development, manufacturing, and/or sales organizations in North America, Europe and the Pacific-Asian region. Shure has participated in Ofcom's spectrum proceedings and analogous digital dividend proceedings in other countries, notably, the United States, Canada, Japan, Australia, and the European Commission. Shure welcomes the opportunity to provide its response to the Ofcom Consultation on the future strategy for use of the UHF (IV and V) bands.[2]

Shure has been heavily involved in the development of new rules for TV band spectrum and the introduction of white space technology in the United States, working closely with the FCC for nearly a decade to help develop rules that enable new unlicenced digital devices to operate on unused VHF and UHF television channels while ensuring that incumbent television receivers and wireless microphones have meaningful protection from harmful interference. Shure also participated extensively in the FCC's consideration of new wireless broadband uses of 700 MHz band frequencies and advised the FCC on the likely impact that a reallocation of the 700 MHz band would have on wireless microphones operating on a secondary basis in that band. In both instances, Shure contributed its technical expertise as well as its real-world experience to asses the effect of the Commission's proposed policies on wireless microphone operations and the user community.

Shure's comments specifically focus on PMSE issues. Shure's principal concern is to ensure that Ofcom takes steps to maintain wireless microphone access to sufficient interference-free spectrum in the UHF band. Shure submits that the Consultation does not fully address all of the material PMSE issues raised by the prospect of clearing PMSE and DTT from the 700 MHz band while permitting PMSE to operate on a temporary basis in the interleaved frequencies in the 600 MHz band that may be made available after the digital switchover. Specifically, in developing a strategy to identify UHF spectrum for mobile broadband, Shure urges Ofcom to consider:

- The extensive and growing PMSE use of UHF frequencies for diverse applications;
- The adverse economic and non-economic impact of repurposing the 700 MHz band for mobile broadband and reducing the amount of spectrum for PMSE;

[1] PMSE wireless microphones as used herein includes a variety of audio devices that operate on a secondary basis on locally unoccupied televisions channels. In addition to wireless microphones, this equipment includes in-ear monitors, wireless intercoms, wireless assist video devices ("WAVDs") and wireless cueing ("IFB") systems.

[2] Ofcom, Securing long term benefits from scarce spectrum resources, a strategy for UHF bands IV and V, Consultation (March 29, 2012) ("Consultation").

- The key importance of UHF spectrum to PMSE and the lack of alternative spectrum for PMSE; and
- The burden on the PMSE industry and users of shifting use from 700 MHz to 600 MHz for six (6) years without plans for adequate UHF PMSE spectrum beyond 2018.

Detailed Response:

Question 1: Do you agree that meeting the future growth in demand for mobile broadband capacity will deliver significant benefits to citizens and consumers?

The prospective benefits from expanded mobile broadband capacity cannot be considered in a vacuum. These potential benefits should not be pursued in a manner that disrupts or impairs PMSE operations that has existed for years in the interleaved UHF spectrum. Any Ofcom action that impairs the operation of PMSE equipment will have far-reaching consequences to the many sectors that rely on PMSE operations (see response to Question 10).

Question 2: Do you agree that additional harmonised mobile broadband spectrum will play an important role in meeting the future growth in demand for mobile broadband capacity? What are your views on the overall quantity of harmonised spectrum that will be required to meet future demand? How does this compare with the expected increase in spectrum for mobile use discussed in this section?

Ofcom's proposal to "release" the 700 MHz band at the expense of existing services and in favor of new mobile broadband services is not justified at this time. Given the permanent harm and disruption that such action would have on existing spectrum users, including particularly PMSE, there is not sufficient evidence that such a dramatic repurposing of the 700 MHz band is warranted. Further, there is little analysis and inadequate planning to address the significant harm to PMSE and other existing users if Ofcom adopts its plan to clear PMSE from the 700 MHz band, even if some additional temporary spectrum is identified in the 600 MHz band.

Question 3: Do you agree that additional harmonised spectrum provided by the 700MHz band could play an important role in meeting the future growth in mobile broadband capacity?

It is possible that additional harmonized spectrum could assist in meeting future growth in mobile broadband capacity but it should not be assumed that redirecting 700 MHz spectrum for this purpose is absolutely necessary. Further, as discussed throughout the response, the repurposing of the 700 MHz band can only be done at the great disruption and expense -- and possibly permanent impairment -- of PMSE and possibly DTT and white space devices.

Question 5: What timing of 700MHz release would maximise the benefits associated with its use for mobile broadband?

Even if Ofcom were to proceed to clear the 700 MHz band, despite the adverse impact to PMSE and other existing services, the proposed 2018 date for clearing does not provide sufficient lead

time for existing PMSE users to transition to other bands. Such a plan would severely burden the PMSE industry and PMSE users by rendering equipment obsolete well before the equipment's natural expiration and scheduled turn over. Given that at least some of this equipment was recently purchased in response to other spectrum changes mandated by Ofcom, a further disruptive government mandated equipment change, the funding of which is yet to be determined, would be particularly onerous and Shure fears that some PMSE users would not be able to recover.

Question 9: Do you agree that a longer term approach to secure benefits from UHF Bands IV and V should consider how to safeguard benefits delivered by the DTT platform?

Yes. In addition, Shure urges Ofcom to consider the extensive benefits of PMSE operations in the interleaved UHF spectrum that have become a vital part of many industry sectors including programming that is utilized in the mobile broadband context. See response to Question 10.

A number of issues important to wireless microphones have not been fully addressed. The Consultation's tentative conclusion to clear the 700 MHz band in favor of mobile broadband services includes little discussion of what spectrum will be available for wireless microphones and on what terms. This issue is critical to the PMSE industry and user community to ensure the continuing availability of professional, high-fidelity wireless audio services in the United Kingdom. For the reasons discussed herein, Shure does not support the "release" of the 700 MHz spectrum but recommends that if Ofcom nevertheless plans to take this step, Ofcom should consider these issues in further proceedings designed to identify protections for PMSE upon the reallocation of the 700 MHz spectrum, and restacking of DTT channels in the 600 MHz band.

Question 10: Are there other material factors affecting the future requirements of PMSE that we should consider as we develop an approach to secure long term benefits from UHF Bands IV and V?

A. PMSE PROVIDES IMPORTANT ECONOMIC AND SOCIAL BENEFITS THAT ARE THREATENED BY OFCOM'S 700/600 MHz PROPOSAL

Yes. Ofcom has proposed to authorize the "release" of 700 MHz spectrum but make available 600 MHz spectrum on a temporary basis for DTT and "and other services making shared use of its spectrum."[3] In forming this proposal, Ofcom has not adequately considered the adverse impact of this plan on the extensive and growing PMSE operations vital to many industry sectors. The 700/600 MHz proposal will inhibit the expected continued growth of PMSE use and impose serious burdens on the PMSE industry and its user community. Actions that impair PMSE operations will negatively affect the broad and diverse universe of users that rely on wireless microphones including applications valuable to British culture and commerce, and ultimately the British citizenry.

[3] *Id.* at Section 1.6.

The development of Ofcom's short term and long term strategy for use of the UHF bands is critical to Shure, other audio equipment manufacturers, broadcasters, and the numerous industries that rely on live and recorded productions to disseminate news, sports, entertainment, educational, government, cultural, religious and business information and programming. For years, PMSE has provided real-time, high-quality, interference-free audio. Today, wireless microphones are an integral part of many high profile and day-to-day uses that are critical to the cultural, artistic, social, political, spiritual and commercial aspects of society.

Not only are wireless microphones integrated in many ways into our daily lives, they make possible the high-quality, advanced audio services that are a fundamental part of the content that consumers access through broadband services. In that respect, wireless microphones are on the front end of the "content" chain that feeds into a wide variety of traditional (e.g. broadcasting) and new (e.g. Internet) multimedia distribution systems. Shure thus believes that continued protection of wireless microphone operations in the UHF (IV and V) band is a key part of, rather than an obstacle to, meeting the growing public demand for mobile broadband services to access multimedia applications.

PMSE wireless microphones are typically used by broadcasters including TV production, radio production, sport production, news gathering, and national events. PMSE systems are also used extensively in non-broadcast applications including use by touring musical groups and actors, musical and theater entertainment productions, movie and other video production, commercial business presentations and conferences, House of Worship services, and universities and schools.[4] Today, in live theater and music, all major artists currently employ multiple channels of wireless microphones and wireless instrument systems.[5] Now, programming is specifically designed around the expected use of wireless audio technology and entire multimedia production chains are now totally dependant on PMSE applications.[6]

Wireless microphone operations are an integral component of services and sectors that are material to the U.K. economy including the British entertainment and creative industries, which according to Government statistics contribute at least £36.3 billion annually to the U.K. economy.[7] Music

---

[4] "[PMSE] encompasses a broad and diverse set of stakeholders, ranging from broadcasters and major theatrical companies to churches and schools, whose use of spectrum includes wireless microphones, wireless cameras and related equipment. Together, they make a major contribution to the economic, social and cultural well-being of the UK." *See* Ofcom, Programme-making and special events, Future spectrum access, Statement, at Section 1.1 (Aug. 31, 2010), available at: http://stakeholders.ofcom.org.uk/binaries/consultations/bandmanager09/statement/statement310810.pdf.

[5] Moreover, stage monitor speakers have been completely replaced by in-ear monitors. 'Reality' television shows are heavily dependent on wireless systems. Contestants typically have a wireless microphone each, more wireless microphones will be deployed to capture sound effects and multiple teams of television commentators will have their own wireless microphone and talk-back systems. See Report from CEPT to the European Commission in Response to Mandate on "Technical considerations regarding harmonisation options for the digital dividend in the European Union," at Section 2.1, p.6 (Oct. 30, 2009) ("CEPT Report 32").

[6] *Id*.

[7] Creative Industries Economic Estimates, Full Statistical Release, Department for Culture, Media, and Sport, at p.1 (Dec. 8, 2011), available at: http://www.culture.gov.uk/images/research/Creative-Industries-Economic-Estimates-Report-2011-update.pdf ("Economic Estimates Release"). "Over 700,000 PMSE devices are in use in Germany alone. In the UK the figure, while difficult to accurately determine is at least as great as that for Germany. Thousands of theatres, TV studios, sports facilities, conference centres, medical institutions, businesses, film studios and live music venues across the EU

and visual and performing arts are the largest employers in the Creative Industries with 300,000 employed (in 2009).[8] Music and visual and performing arts account for the largest contribution to the number of businesses (1.46% of the UK for enterprises and 1.21% of the UK for local units in 2011).[9]

Shure expects that wireless microphone use will become more -- not less -- important as our society continues to take advantage of innovations in advanced audio technology to support even more demanding and elaborate productions to relay messages and performances. Further, Shure expects the demand for PMSE will increase as the public continues to adopt broadband services as a principal means of acquiring multimedia content.[10]

B. OFCOM'S PROPOSAL TO CLEAR 700 MHZ FREQUENCIES EXCLUDING PMSE FROM THE UHF SPECTRUM HISTORICALLY USED WILL DISRUPT AND IMPAIR PMSE OPERATIONS AND USERS.

To the extent that Ofcom is proposing to make spectrum changes that radically alter *what* spectrum PMSE may use and *how much* spectrum remains available to PMSE, Shure submits that Ofcom should consider in its analysis the significant adverse economic impact that such changes will have on PMSE operators and users. PMSE users currently have difficulty finding sufficient spectrum to support larger events and elimination of 700 MHz frequencies will greatly exacerbate this situation. The Consultation does little to resolve this problem even considering the proposal that PMSE may use interleaved 600 MHz frequencies temporarily until 2018. In fact, given current and future demand for PMSE, Shure believes that PMSE should have access to the interleaved channels in both the 600 MHz and the 700 MHz bands.

This scenario will certainly impose significant costs on the PMSE industry who will be faced with new equipment purchases once and possibly twice (first to operate in frequencies other than the 700 MHz band and later as 600 MHz band becomes insufficient). Wireless microphone users will generally need to replace their equipment, due to the fact that many wireless microphone systems are designed to tune across a specific portion of the TV band. Moreover, PMSE equipment, especially professional audio equipment, is expensive and is manufactured to last well beyond the six (6) years contemplated in the Consultation. "Retuning" wireless microphone equipment to a different frequency band generally cannot be accomplished through a mere adjustment by a dealer or manufacturer's service agent and cannot be accomplished by an operator in the field. In most instances, the change to a new frequency band will require such a substantial modification by the manufacturer that wholesale replacement is the only practical choice.

---

employ PMSE devices to create and deliver content that is either consumed live by the general populace or recorded for re-distribution via broadcast or recorded media. However, it is impossible to put a financial figure on the social and cultural value for the EU that is generated by PMSE by these applications." *See* Association of Professional Wireless Production Technologies, Additional Comments to the European Commission at p. 1 (March 6, 2009), available at: http://www.analysysmason.com/PageFiles/11730/APWPT%20(1).pdf

[8] Economic Estimates Release at p.1.

[9] *Id*.

[10] Other manufacturers also predict that a yearly average increase of about 5% in PMSE units is to be expected in the next decade. *See* CEPT Report 32, at Section 4.5.

Shure questions the Consultation's assumptions that PMSE will have sufficient spectrum in the event that the 700 MHz band is auctioned and interleaved 600 MHz band spectrum is made temporarily available. Further, the Consultation does not address what status PMSE will have in the 600 MHz band or elsewhere at the proposed 2018 turnover date.

Shure also challenges the Consultation's assumption that digitisation will ensure that PMSE will have sufficient spectrum even as the spectrum to which it has access shrinks. The Consultation states only that that future use of the DTT spectrum will occur "through the progressive digitisation of PMSE services and cognitive radio developments"[11] and "early signaling to the market that changes in equipment may be required."[12] Digitisation of PMSE equipment will not eliminate the need for significant UHF spectrum albeit on a shared basis.

C. PMSE OPERATIONS IN THE INTERLEAVED UHF SPECTRUM MUST BE PRESERVED; NO SUITABLE ALTERNATIVE SPECTRUM IS AVAILABLE

PMSE equipment is currently intensively operated in the UHF (IV and V) bands in the U.K. (and in most CEPT countries) in the interleaved spectrum between broadcasting allotments on a secondary basis, e.g., on a non-interfering and non-protected basis with regard to the terrestrial broadcasting and other primary services. Today, UHF spectrum is the primary band for radiomicrophones, in-ear monitoring and portable audio links, talk-back and wireless intercom, mobile and temporary audio links. [13] This spectrum provides the optimum balance of signal propagation and antenna size, battery life and limited body absorption life. Given these characteristics and the historical primary use of the UHF bands, all research and development of PMSE technology has been concentrated in the UHF bands. No other spectrum with comparable characteristics is available.

PMSE is struggling to find the wireless spectrum needed to support a typical modern show. It is not unusual for major production events to require fifty to one hundred wireless microphone channels or more. For these large events, spectrum is in short supply today, and it is already a challenge to establish and implement the necessary complex frequency plans.[14] To avoid intermodulation, current practice is to use no more than eight microphones in an 8 MHz channel in very large productions.[15] In large urban areas, there is a continuous heavy demand (typically multi-equipment, multi-channel users) for PMSE spectrum, thus most of the available UHF spectrum is needed to satisfy this demand.

---

[11] Consultation at Section 7.3.

[12] *Id*. at Section 7.26.

[13] CEPT Report 32 at Section 2.2.1.

[14] Current alternative technologies are unable to perform at these levels. For example, Bluetooth, Wi-Fi and digital wireless microphones suffer from latency and limited range issues. Even if current alternative technologies could perform at the level of wireless microphones, multi-channel systems would require significant amounts of spectrum to operate successfully.

[15] CEPT Report 32 at Section 2.2.2.

Question 11: Are there other material factors affecting the future requirements of Local TV that we should consider as we develop an approach to secure long term benefits from UHF Bands IV and V?

Local TV is uniquely capable of providing local programming. For this purpose, local TV needs sufficient spectrum for its TV operations. In addition, like other broadcasters, local TV utilizes PMSE extensively for programming. In the local news environment, wireless microphones are an essential component to roving news trucks covering local and late-breaking news. Thus, local TV also has a vested interest in ensuring that PMSE operations can continue on in the UHF band unimpaired.

Shure recommends Ofcom designate channels 35-38 for PMSE operations protected from interference from new devices such as white space devices. These reserve channels would be particularly useful to roving news truck operations that find it impractical to register channels in a database to protect frequencies in advance of equipment use.

Question 12: Are there other material factors affecting the future requirements of WSD applications that we should consider as we develop an approach to secure long term benefits from UHF Bands IV and V?

Given the extensive PMSE use of the UHF bands, Ofcom should ensure that PMSE will continue to have access to interference-free spectrum on a priority basis (except for DTT) in the UHF (IV and V) bands. Any secondary use of the interleaved spaces will need to ensure that the stable and quiet spectrum environment required by professional wireless microphones remains viable. If the 700 MHz band is cleared, white space devices will also have access to a reduced amount of interleaved spectrum even if the 600 MHz band is made available. As the Consultation acknowledges, the geolocation database/white spaces scheme has still not been implemented. White spaces equipment is still maturing and has not been deployed. Some groups have called for further white space device testing to assess the interference potential to PMSE.[16] Shure supports further white space device testing prior to granting white space devices access to the 700 MHz or 600 MHz interleaved spectrum.

As discussed above, Shure recommends that Ofcom designate channels 35-38 as spectrum dedicated to PMSE**.** These channels will provide necessary flexible UHF spectrum to support wireless microphone operations that require access to interference-free channels but cannot, for practical reasons, register for use in advance. In particular, roving news trucks are often rushing to cover breaking news and cannot register channels to be used in advance. Such dedicated channels will also be utilized by the many nonprofessional users who do not require the use of multiple wireless microphones or the certainty of database registration and whose equipment can tune to the lower UHF band.

[16] *See e.g.*, Response to Consultation, Securing long term benefits from scarce spectrum resources - A strategy for UHF Bands IV and V, British Entertainment Industry Radio Group (June 1, 2012).

Question 15: Do you agree that the approach that is most likely to secure significant benefits from UHF Bands IV and V over the long term is one that enables the release of the 700 MHz band for mobile broadband whilst also ensuring the role of the DTT platform is safeguarded?
Whether long term benefits of the UHF band are made available depend, in part, on whether PMSE will continue to have access to an adequate amount of interference-free spectrum after Ofcom's plan is implemented. As discussed in response to Question 10, the UHF bands are used not only by DTT but also by PMSE. PMSE uses are expanding and there is no suitable substitute spectrum available. See discussion in response to Question 10.

Question 17: Do you believe that using the 600MHz band for DTT after clearing the 700MHz band would reduce the risk that the DTT platform will not be able to continue to provide important citizen and consumer benefits?

Providing DTT access to 600 MHz spectrum in the event that 700 MHz spectrum is reallocated will mitigate some of the loss of spectrum for DTT but it will do little to avoid or mitigate the adverse affects on PMSE. As discussed in response to Question 5, PMSE and the sectors that depend on PMSE will suffer from the reduction in available spectrum as well as the significant disruption of being compelled to acquire new equipment -- again -- as Ofcom changes the spectrum rules.

Question 18: Do you agree that the future benefits for citizens and consumers of enabling the release of the 700MHz band whilst maintaining the role of DTT are likely to outweigh the loss in benefits of the 600MHz band not being able to be used for other services in the long term?

No. Shure does not agree that the 700 MHz should be reallocated at this time. Both the 700 and 600 MHz UHF bands support extensive PMSE operations which are vital to many industries as discussed at length in response to Question 10. The Consultation has not made the case that the reallocation of the 700 MHz band along with the attendant disruption and harm to existing users is justified at this time.

Question 19: Have we identified correctly the possible short-term uses of the 600MHz spectrum? Are there other short-term uses we should consider?

No, as discussed above, the Consultation does not adequately addressed issues important to PSME raised by this proposal.

Question 22: Do you agree that the approach set out in this consultation is likely to secure significant benefits for citizens and consumers over the long term?

The answer to this question depends on whether and to what extent Ofcom takes steps to protect PMSE operations now and in future phases of its proposal. If adequate protections are not developed and incorporated into this proposal, Shure submits that the Consultation's approach falls short of securing significant benefits for citizens and consumers over the long term.

Question 23: Have we correctly identified the main areas of future work that could follow this consultation process subject to its outcome?

No. As discussed above, the Consultation does not address or address completely issues raised by its proposal to clear the 700 MHz band that are material to the PSME industry and the various user sectors that rely on PMSE. The Consultation does not examine the significant economic and noneconomic costs of disrupting and potentially impairing PSME operations by clearing the 700 MHz band and limiting UHF spectrum available to PMSE. The Consultation also does not set forth the UHF spectrum that will be made available to meet the extensive and growing demand for PMSE, including wireless microphone reserve channels, on a long term basis and the terms of such access. Should Ofcom decide to pursue its plan to clear the 700 MHz band, Shure recommends that Ofcom consider these issues in further proceedings before moving ahead.

Very truly yours,

/s/

Catherine Wang
Counsel to Shure Incorporated

Bingham McCutchen LLP
2020 K Street, NW
Washington, D.C. 20006-1806

Phone: +1-202-373-6037
Fax: +1-202-373-6001
Email: catherine.wang@bingham.com

cc: Mark Brunner
Senior Director Global Brand Management

Edgar C. Reihl, P.E.
Technology Director, Advanced Development

Shure Incorporated
5800 Touhy Avenue
Niles, IL 60714-4608