

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Sennheiser Electronic Corporation, Request for)	
Amendment of Part 74 of the Commission's)	RM-11821
Rules to Advance the Use of Spectrum Efficient)	
Wireless Microphone Equipment)	

COMMENTS OF SHURE INCORPORATED

Shure Incorporated (“Shure”), by its undersigned counsel, hereby submits these comments in response to the Petition for Rulemaking (“Petition”) filed by Sennheiser Electronic Corporation (“Sennheiser”) in the above-captioned proceeding.¹ Shure supports the initiation of a Notice of Proposed Rulemaking (“NPRM”) to seek input from interested stakeholders and to develop consensus-driven rule changes that will promote continued innovation and development of new wireless microphone technologies such as Wireless Multi-Channel Audio Systems (“WMAS”) technology. Shure herein recommends that if the Commission grants the Petition and decides to move forward with an NPRM, the Commission seek public input on certain specific technical and operational issues that should be addressed in Part 74 rule changes regarding WMAS wireless microphone systems.

In its Petition, Sennheiser proposes certain changes to the Commission’s Part 74 low power auxiliary rules to enable use of WMAS wireless microphone technology, which

¹ *In the Matter of Sennheiser Electronic Corporation, Request for Amendment of Part 74 of the Commission’s Rules to Advance the Use of Spectrum Efficient Wireless Microphone Equipment, RM-11821, Petition for Rulemaking (filed Aug. 17, 2018) (“Petition”).*

“digitally combines the signals from multiple devices into a single 6 MHz channel,”² operating with improved spectrum efficiency and reduced average power spectral density, allowing frequency reuse at nearby locations.³ Specifically, the Petition proposes new language for Sections 74.801 and 74.861(e) that will add a definition of WMAS and allow WMAS systems to use up to 6 MHz bandwidth, which exceeds the currently specified maximum of 200 kHz operating bandwidth, “when transmitting the signals of not fewer than 12 conventional low power auxiliary stations devices.”⁴ Sennheiser further asks the Commission to clarify that “advanced wireless microphone equipment in the 941.5-952 MHz and 1435-1525 MHz bands can use 6 MHz channels.”⁵

Established in 1925, Shure is the leading U.S.-based global manufacturer of high-quality wireless microphones and other professional audio products classified as low-power auxiliary devices. Shure has participated extensively in various regulatory proceedings in the United States and in other countries grappling with the scarcity of spectrum available to meet the increasing demand for high quality audio in a broad range of applications, particularly in the context of larger scale productions.⁶ As a long-time

² Petition at 4.

³ *Id.* at 5-6.

⁴ *Id.* at Attachment, Proposed Rule Language.

⁵ *Id.* at 1.

⁶ *See, e.g., Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 25 FCC Rcd 643 (2010); *Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices below 900 MHz and in the 3 GHz Band*, Second Memorandum Opinion and Order, 25 FCC Rcd 18661 (2010); *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567 (2014); *Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap, Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, ET Docket No. 14-165, GN Docket No. 12-268, Notice of Proposed Rulemaking, FCC 14-144 (rel. Sept. 30, 2014); *Amendment of Part 15 of the*

proponent of wireless microphone innovation and development that enhances efficient use of spectrum, particularly in congested UHF channels, Shure has contributed its extensive product experience and technical expertise to help shape spectrum policies and technical requirements in a way that addresses competing demands for spectrum and facilitates evolving wireless microphone technologies. Shure has been deeply involved in the ETSI European Standard proceedings relevant to wireless microphones (referred to as radio microphones using bands allocated for Programme Making and Special Events (PMSE)) which includes standards to address WMAS applications “designed to support various combinations of transmission parameters in accordance with particular goals for audio quality, robustness, working range etc.”⁷

Shure supports the initiation of a rulemaking proceeding to update the Commission’s Part 74 rules. This proceeding would provide a valuable opportunity to gather stakeholder input on proposed rule revisions that foster wireless microphone innovation and promote the efficient use of spectrum. Shure provides the following recommendations for the Commission’s consideration as it assesses whether to grant the Petition and, if so, what issues and proposed revisions should be identified in the NPRM to permit the use WMAS technology under Part 74 of the Commission’s Rules.

Commission’s Rules for Unlicensed Operations in the Television Bands et al., ET Docket No. 14-165, GN Docket No. 12-268, Report and Order, FCC 15-99 (rel. Aug. 11, 2015); *In the Matter of Promoting Spectrum Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Notice of Proposed Rulemaking, FCC 14-145 (rel. Sep. 30, 2014); *In the Matter of Promoting Spectrum Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Report and Order, FCC 15-100 (rel. Aug. 11, 2015).

⁷ See ETSI EN 300 422-1 V2.1.2 at 17 (“ETSI EN 300 422-1”), available at https://www.etsi.org/deliver/etsi_en/300400_300499/30042201/02.01.02_60/en_30042201v020102p.pdf.

I. Compatibility with Other Systems Should Be Studied as a Preliminary Measure.

As a threshold matter, the Commission should solicit studies of the compatibility of proposed WMAS technology with other systems such as DTV (in the 470-608 MHz band), mobile phones (in the guard bands), and narrowband analog and digital wireless microphones in all bands. Such studies should confirm or inform the development of appropriate technical parameters that should be adopted to support harmonious coexistence of WMAS technology with existing services.

II. Any Proposed Change to the Commission’s Rules Should Reflect a Spectral Efficiency of at Least Three (3) Audio Channels Per MHz, Regardless of Frequency Band of Operation.

Shure urges that any rule changes adopted require that WMAS operations “have at least one mode, defined as the Standard Mode, which supports a minimum of three audio links per MHz”⁸ regardless of the frequency band of operation, to encourage efficient use of spectrum that is in line with the ETSI European Standard for WMAS transmission. As discussed in the ETSI standard, in order to justify the additional bandwidth that WMAS applications consume, these systems should be designed to deliver higher spectral efficiency than traditional narrowband single channel transmitters.⁹ WMAS should therefore be required to support a *minimum* of three audio channels per MHz, which equates to 18 audio channels in a 6 MHz block.

In the Petition’s Proposed Rule Language, Sennheiser provides that “a system may treat the 941.5-944 and 944-952 MHz bands as a single band.”¹⁰ Shure maintains that even

⁸ *Id.*

⁹ *See id.*

¹⁰ Petition at Attachment, Proposed Rule Language.

if this band is aggregated and viewed as a single band, the number of audio channels supported by WMAS technology should be contingent on the amount of spectrum available and must have the capability to provide at least three audio channels per MHz.

III. The NPRM Should Seek Comment on Specific Technical Rules for Successful Operation of WMAS Devices.

Shure urges the Commission to seek comment on specific technical parameters to which WMAS devices will be required to adhere, including permissible frequencies for WMAS operation, maximum permitted output power, an appropriate bandwidth mask, and out-of-band emissions limits. Any proposed rule changes should be carefully considered and supported by compatibility studies with existing in-band and adjacent band operations.

A. Permitted Frequency Bands

While the aspirational goal may be to permit WMAS in all spectrum bands allocated for wireless microphone operations, Shure urges the Commission to consider whether it might be prudent to permit WMAS in only selected frequency bands as a preliminary measure. For example, it may not make sense to permit these operations on the 1435-1525 MHz band as an initial matter, given that equipment authentication and software-based controls necessary for coordination with the Aerospace and Flight Test Radio Coordinating Council, the non-governmental coordinator for assignment of flight test frequencies in the band, are still under development.

B. Maximum Permitted Output Power

The maximum permitted output power of WMAS devices needs to be established. Rather than proposing a fixed maximum value, Shure proposes that power levels should be calculated on a Power Spectral Density basis (i.e., dBm/MHz, for example), to permit power levels to scale appropriately.

C. Appropriate Channel Bandwidth and Mask.

ETSI standard EN 300 422-1 permits a channel bandwidth of up to 20 MHz for WMAS systems.¹¹ The appropriate channel bandwidth should be evaluated with regard to the various frequency bands available for wireless microphone operations. The occupied bandwidth mask also needs to be defined. The existing bandwidth masks applicable to narrowband digital systems may not be adequate for a WMAS and should be evaluated as part of the compatibility studies discussed above.

D. Out-of-Band Emissions.

The level of permissible out-of-band emissions, which impact compatibility with other systems operating on adjacent or nearby frequencies, needs to be studied and clearly defined with respect to WMAS.

IV. The NPRM Should Seek Comment on Proposed WMAS Testing and Equipment Approval Parameters.

The NPRM should also seek comment regarding appropriate testing and equipment approval measures for WMAS devices. These rules should include, for example, test conditions, conducted and radiated measurements, and defined measurement parameters such as the type of detector (e.g. peak, quasi-peak, or RMS), etc.

V. Conclusion

The development of WMAS technology is one example that illustrates the professional audio community's continued commitment to innovations that drive efficient use of scarce spectrum resources to meet the needs of users. In the interest of updating the Commission's rules to facilitate continued innovation, Shure supports the release of an

¹¹ See ETSI EN 300 422-1, at 18.

NPRM to consider the technical and operating parameters necessary for successful WMAS operation that is compatible with existing in-band and adjacent operations.

Respectfully submitted,

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