

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

In the Matter of)	
)	
Promoting Spectrum Access for Wireless Microphone Operations)	GN Docket No. 14-166
)	
)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions)	GN Docket No. 12-268
)	

REPLY COMMENTS OF SHURE INCORPORATED

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SUMMARY

Shure applauds the Commission's efforts to accommodate long-term needs of wireless microphone users in the wake of broadcast television band spectrum repurposing and offers its views with respect to other commenters' responses and proposals submitted to address issues that impact wireless microphone users. As discussed in Shure's initial Comments, the importance of this proceeding to the wireless microphone industry and the broader community of industries that rely on wireless microphones cannot be overstated. Professional audio wireless microphone users have not recovered from the loss of 700 MHz spectrum repurposed in 2010 and now face the additional loss of 600 MHz spectrum the Commission proposes to repurpose in the forthcoming Incentive Auction.

Initial comments provided overwhelmingly positive support for Commission proposals to identify additional spectrum to meet wireless microphone needs and to address the deficits caused by recent steps to repurpose a significant amount of spectrum previously available for wireless microphone use to high-power wireless broadband. Industry commenters largely agree as to which spectrum bands between 150 MHz and 2 GHz would best support professional wireless microphone uses and thus should be afforded priority in consideration for repurposing. Comments filed by primary spectrum incumbents were largely supportive of secondary wireless microphone operations with the implementation of appropriate interference protection mechanisms. Shure is hopeful that a successful resolution to the instant proceeding will ensue and looks forward to contributing further input on the various technical and regulatory issues that must be addressed in this proceeding.

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REPLY COMMENTS OF SHURE INCORPORATED

Shure Incorporated (“Shure”) hereby submits these reply comments in response to the Federal Communications Commission (“FCC” or “Commission”) Notice of Proposed Rulemaking (“NPRM” or “Notice”) in the above-captioned proceeding.¹ Shure applauds the Commission’s efforts to accommodate long-term needs of wireless microphone users in the wake of repurposing of broadcast television band spectrum and offers its views with respect to other commenters’ responses and proposals submitted in response to issues posed in the NPRM that impact the needs of wireless microphone users.

¹ *In the Matter of Promoting Spectrum Access for Wireless Microphone Operations, et al.*, Notice of Proposed Rulemaking, GN Docket Nos. 14-166, 12-268, FCC 14-145 (rel. Sep. 30, 2014) (“*Notice*” or “*NPRM*”).

I. DIVERSE COMMENTERS ENTHUSIASTICALLY SUPPORT THE COMMISSION’S PROPOSAL TO MAKE ADDITIONAL SPECTRUM AVAILABLE FOR WIRELESS MICROPHONES

Industry commenters responding to the Notice express concern that the lack of spectrum available for professional audio wireless microphone use presents an immediate and serious problem. The comments reflect widespread support for the Commission to expeditiously identify and make available supplemental spectrum for wireless microphone use. Many commenters also strongly support the creation of secondary allocations in bands expressly identified in the Notice as a mechanism to recover some of the spectrum lost due to the recent 700 MHz Band transition and forthcoming 600 MHz Band transition.

A. Commenters Agree that the Lack of Sufficient Spectrum for Wireless Microphone Operations Presents an Urgent Problem

Shure’s comments explained that insufficient spectrum exists today to support large-scale events without seeking special temporary authority from the Commission, and that many events and productions that require professional audio wireless microphones may not be viable after the 600 MHz Band transition.² A diverse set of commenters agreed with Shure’s assessment of the spectrum outlook for professional audio wireless microphones. For example, Sennheiser Electronic Corporation (“Sennheiser”) maintains that “one of the most important goals of this proceeding must be to find a suitable replacement for lost UHF spectrum as well as spectrum to meet the growing demand for wireless microphones.”³ Sennheiser further notes that, given that major events require up

² *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Shure Incorporated (filed Feb 4, 2015) (“*Shure Comments*”).

³ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Sennheiser Electronic Corporation, at ii (filed Feb 4, 2015) (“*Sennheiser Comments*”).

to 350 MHz of total spectrum, the “loss of additional UHF spectrum poses great challenges to wireless microphone operators.”⁴ Lectrosonics, Inc. voices support for the Commission’s stated goals of “making more efficient use of spectrum and identifying new spectrum allocations for wireless microphone operation,” emphasizing that the industry “will face significant [spectrum availability] challenges in the wake of the Incentive Auction.”⁵ Audio-Technica U.S., Inc. (“A-T”) anticipates “severe spectrum crowding” and “supports the Commission’s efforts to find ways to preserve the important function that wireless microphones serve in our society.”⁶

Shure urges the Commission to heed commenters’ observations that the “extensive use of wireless microphones in a wide range of industries make it essential to mitigate the effects of the Incentive auction on spectrum availability.”⁷

B. Commenters Express Meaningful Support for Wireless Microphone Operations in Specific Bands Proposed by the Commission

Shure’s comments expressed enthusiastic support for the Commission’s proposals to make additional spectrum available for wireless microphone operations, including frequencies between 150 MHz and 2 GHz in the radiofrequency bands with sufficient bandwidth and viable propagation characteristics to support multiple professional audio

⁴ *Sennheiser Comments* at 25.

⁵ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Lectrosonics, Inc., at ii (filed Feb 4, 2015) (“*Lectrosonics Comments*”).

⁶ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Audio-Technica U.S., Inc., at 19-20 (filed Feb 4, 2015) (“*Audio-Technica Comments*”).

⁷ *Lectrosonics Comments* at 1. *See also Sennheiser Comments* at ii (noting the “importance of wireless microphones to our economy and society, as well as the difficulty the industry now faces given the loss of UHF spectrum and the transition from 600 MHz, especially in light of the loss of 700 MHz spectrum in 2010”).

wireless microphones.⁸ Shure noted that expedited availability of this spectrum will ensure a smoother 600 MHz Band transition and also help preserve U.S. leadership in multimedia content production.

1. 941-960 MHz Band

Shure agrees with Sennheiser that “access to the entire 941-960 MHz band is vitally important to the wireless microphone industry, as it is the most attractive alternative to address the loss of UHF spectrum.”⁹ Shure also shares Sennheiser’s sentiment that wireless microphones “can co-exist with [Multiple Address Service (“MAS”)] licensees” given that they have “co-existed with studio transmitter links for many years” and “operate at extremely low power levels and fairly short range[s].”¹⁰ Shure maintains that the revised framework proposed in its comments (including a power limit of 250 mW consistent with wireless microphone rules in the broader UHF broadcast television band and coordination requirements) would successfully enable wireless microphone operations in the 941-960 MHz band while fully protecting incumbent spectrum users.¹¹

2. 1435-1525 MHz Band

Shure and Sennheiser identify the 1435-1525 MHz band as having the highest potential to provide a meaningful amount of spectrum for wireless microphone operations.¹² The parties both note that microphone users have already been operating in

⁸ *Shure Comments* at 35.

⁹ *Sennheiser Comments* at 22. *See also Lectronics Comments* at 1 (recommending “that the 941-944 MHz and 952-960 MHz bands should be made available for LPAS operation on a secondary basis.”)

¹⁰ *Sennheiser Comments* at 23.

¹¹ *See Shure Comments* at 36-38.

¹² *Sennheiser Comments* at 23. *See Shure Comments* at 38-40.

this band pursuant to special temporary authority and express confidence that wireless microphones could operate in this band on a secondary basis while providing existing aeronautical mobile telemetry (“AMT”) operations with interference protection.¹³ Moreover, as Sennheiser aptly points out, the 1435-1525 MHz band is an ideal option for permitted wireless microphone operations given that it “seems promising that 1425- 1525 MHz, or at least a large part of it, will become an internationally harmonized band for wireless microphone use.”¹⁴

3. 169-172 MHz Band

Shure agrees with Sennheiser’s support for the Commission’s proposal to make available “as much as possible of the 169-172 MHz band for wireless microphone use on a secondary basis”¹⁵ noting that wireless microphones are willing to coordinate for these bands as they have for others. As discussed in its comments, Shure proposes enabling 200 kHz emission in this band with a 50 mW power limit, with guard bands at the top and bottom of the band that prevent the assignment of center frequencies for wireless microphones within the 100 kHz of spectrum immediately adjacent to each band edge.¹⁶ Shure’s proposed framework would yield additional spectrum for non-critical wireless microphone applications, while protecting higher priority federal users in the band that operate with dramatically higher power levels and spectrum density in narrow 12.5 kHz channels.

¹³ See *Shure Comments* at 39; *Sennheiser Comments* at 24. Shure also offered specific technical recommendations for wireless microphone operations in the 1.4 GHz band, including required coordination with the Aerospace and Flight Test Radio Coordinating Council. See *Shure Comments* at 39.

¹⁴ *Sennheiser Comments* at 24. ,

¹⁵ *Sennheiser Comments* at 22.

¹⁶ *Shure Comments* at 34-35.

II. INCUMBENT INTERESTS PROVIDE THOUGHTFUL COMMENTS WITH RECOMMENDATIONS FOR SECONDARY WIRELESS MICROPHONE USE IN PROPOSED FREQUENCIES

The comments filed by the primary spectrum incumbents in proposed supplemental bands demonstrate that wireless microphone use can be accommodated on a secondary basis with appropriate interference safeguards to ensure comprehensive protection for the existing, higher priority service. In particular, comments filed by incumbent users support the Commission’s proposal that the 1435-1525 MHz band and 941-960 MHz band can be shared with professional audio wireless microphones on a secondary basis with appropriate service rules.

A. The Aerospace and Flight Test Radio Coordinating Council, Inc. Offers Recommendations for Secondary Wireless Microphone Operations in the 1435-1535 MHz Band

The Aerospace and Flight Test Radio Coordinating Council, Inc. (“AFTRCC”), the coordinator for shared Government/Non-Government spectrum allocated for flight testing, filed thoughtful and extensive comments concerning the operation of professional audio wireless microphones on a secondary basis in the 1435-1525 MHz band.¹⁷ At the outset, AFTRCC’s comments recognize the “public interest in making sure adequate spectrum is available”¹⁸ for wireless microphones and “lauds the Commission for commencing this proceeding and addressing the future needs of wireless microphones in a timely fashion in anticipation of a reduction in access to spectrum.”¹⁹ Thereafter, AFTRCC’s comments provide several recommendations that would help facilitate the

¹⁷ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Aerospace and Flight Test Radio Coordinating Council, Inc. (filed Feb 4, 2015) (“*AFTRCC Comments*”).

¹⁸ *AFTRCC Comments* at i.

¹⁹ *AFTRCC Comments* at 10.

secondary operation of audio wireless microphones in the 1435-1525 MHz band, including that use be restricted to licensed, professional users,²⁰ that technological-based controls be integrated into wireless microphones to ensure that operations occur at coordinated locations,²¹ and that the Commission prohibit the use of existing microphones available today that are not modified and recertified to meet new service rules.²² Shure appreciates these recommendations, and agrees that any future service rules for secondary wireless microphone operations in the 1435-1525 MHz band must ensure that critical AMT services continue to receive comprehensive protection from harmful interference. Shure looks forward to working with AFTRCC in good faith to ensure that the instant record develops such rules.

B. The Society of Broadcast Engineers Supports Secondary Wireless Microphone Operations in the 941-960 MHz Band with Appropriate Service Rules

The Society of Broadcast Engineers (“SBE”), which coordinates Aural Studio to Transmitter Links (“STLs”) and fixed Aural Intercity Relay Links (“ICRs”) in the 944-952 MHz band, stated that the broader 941-960 MHz band is “sufficiently large as to provide a good option for displaced licensed broadcast and licensed LPAS [microphone] use.”²³ SBE stated that although incumbents, including MAS and private and common carrier services in the 941-944 and 952-960 MHz bands would require protection, wireless microphone “licensees could be permitted to make greater use of [the 941-960

²⁰ See *AFTRCC Comments* at 11-12.

²¹ See *AFTRCC Comments* at 17-23.

²² *AFTRCC Comments* at 24.

²³ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of The Society of Broadcast Engineers, Incorporated, at 12-13 (filed Feb 4, 2015) (“*SBE Comments*”).

MHz] band on a coordinated basis.”²⁴ Shure agrees with SBE’s assessment, which aligns with its own proposal for the 941-960 MHz band.²⁵

III. DISCRETE OBJECTIONS TO SECONDARY WIRELESS MICROPHONE OPERATIONS IN THE 1435-1525 MHZ BAND RAISE NO SUBSTANTIVE TECHNICAL OR POLICY ISSUES

A small minority of commenters objected to a secondary wireless microphone allocation in the 1435-1525 MHz band, yet these comments did not raise substantive concerns about the feasibility of wireless microphone operations in the band. Instead, comments were filed by parties that are either currently engaged in operations in the band under Special Temporary Authority or who recommended exploring the 1435-1525 MHz band for alternative uses far outside the scope of this proceeding.

A. Broadcast Sports Incorporated Currently Deploys Equipment in 1435-1525 MHz, Indicating the Value of this Band in Alleviating UHF Shortages

Broadcast Sports Incorporated’s (“BSI’s”) comments recommend that the Commission not permit wireless microphones in the 1435-1525 MHz band because it is already used by “program production companies who are in need of video-bandwidth for transmission . . . , due to acute spectrum shortages for TV Pickup and video relay in many areas due to normal overloading of the BAS/CARS/LTTS bands 2020-2110 MHz and 2450-2483.5 MHz.”²⁶

Shure urges the Commission to reject BSI’s recommendation. It is not in the public interest to deny access to spectrum urgently needed by a broader group of

²⁴ *Id.* at 13.

²⁵ *See Shure Comments* at 36-38.

²⁶ *In the Matter of Promoting Access for Wireless Microphone Operations, et al.*, GN Docket Nos. 14-166, 12-268, Comments of Broadcast Sports, Incorporated, at 14 (filed Feb 4, 2015) (“*BSI Comments*”).

responsible secondary licensees that can work cooperatively with the existing coordinating body to ensure that the primary use continues to secure full interference protection.

The loss of spectrum in the 700 MHz band in 2010 had an immediate impact on large event production and, since that time, the number of requests for Special Temporary Authority to operate in the 1435-1525 MHz band has increased dramatically, with many requests coming from BSI. BSI already offers a suite of wireless microphone products for use in the 1435-1525 MHz band.²⁷ Based on its own experience, BSI fully appreciates that the band has suitable propagation characteristics and will support licensed, professional audio wireless microphone use, and the Commission should ignore further assertions that the band will not accommodate a secondary wireless microphone allocation if appropriate interference protections are put in place for AMT service.

In response to BSI's concern regarding the lack of bandwidth for video, Shure believes that the balance of deployment between wireless video and audio in this band can be determined and coordinated on site by event producers, but should not preclude the use of 1435-1525 MHz frequencies by licensed wireless microphone operators in the rest of the country. In the event that this band is made available for use by wireless microphones, the Commission can consider how it could be shared between the two types of uses if need be. The band is relatively large (90 MHz) and it is likely that there is sufficient room to accommodate both uses if coordinated locally.

²⁷ See BSI Wireless Audio Systems, BSI MIC1500 <http://www.broadcastsportsinc.com/products-services/bsi-mic1500-wireless-microphone.aspx> (last visited Feb. 23, 2015).

Fully transparent and permanent rules that allow licensed and certificated microphones to use the 1435-1525 MHz band on a secondary basis after coordination with AFTRCC, as Shure has proposed, would serve the public interest.²⁸

B. CTIA - The Wireless Association Comments Raises Issues Related to the 1435-1525 MHz Band Outside the Scope of the Instant Proceeding

CTIA - The Wireless Association (“CTIA”) argues that the 1435-1525 MHz band is “ideally suited for mobile broadband spectrum,” which is “becoming increasingly scarce.” CTIA raises no other technical or policy objections with respect to licensed wireless microphone use of the band.

The use of the 1435-1525 MHz band for mobile broadband use is far outside the scope of the instant proceeding, and Shure urges the Commission to disregard CTIA’s arguments with respect to the band. Even if the scope of the proceeding did encompass CTIA’s supposed concerns, Shure disagrees that mobile broadband spectrum is becoming scarce. Mobile broadband services consuming 700 MHz Band and 600 MHz Band spectrum previously available for wireless microphone use is the underlying catalyst for the instant proceeding, and the Commission continues to explore many different options for providing additional mobile broadband spectrum.²⁹ Shure also strongly disagrees that the 1435-1525 MHz band is suitable for high-power mobile broadband service. As described in AFTRCC’s comments, the incumbent AMT services in the 1435-1525 MHz band are extremely sensitive and can experience interference in

²⁸ See *Shure Comments* at 39.

²⁹ See, e.g., Federal Communications Commission, *Connecting America: The National Broadband Plan* (2010), available at <http://www.broadband.gov>; PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (rel. July 20, 2012), available at http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf.

the presence of even low-power co-channel operations.³⁰ High-power mobile broadband transmitters would be an interference threat to AMT services at tremendous distances, thus making the 1435-1525 MHz a poor choice for such services.

IV. CONCLUSION

Shure enthusiastically supports the Commission's efforts in this proceeding, and looks forward to contributing further input on the various technical and regulatory issues that must be addressed to develop a comprehensive record and identify future supplemental spectrum for wireless microphone use. Based on the overwhelmingly positive responses to Commission proposals to identify additional spectrum to meet wireless microphone needs and to address the deficits caused by recent steps to repurpose a significant amount of spectrum previously available for wireless microphone use to high-power wireless broadband, Shure is hopeful that a successful resolution to the proceeding will ensue.

Respectfully submitted,

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³⁰ See *AFTRCC Comments* at 5, 10.