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

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band	)	GN Docket No. 12-354

COMMENTS OF SHURE INCORPORATED

Shure Incorporated ("Shure") hereby submits these comments in response to the Federal Communications Commission ("FCC" or "Commission") Further Notice of Proposed Rulemaking proposing shared commercial and government use of the 3550-3650 MHz band ("3.5 GHz") band.[1]

I. BACKGROUND

Shure is the leading U.S.-based manufacturer of high-quality wireless microphones[2] and other professional audio products classified as low-power auxiliary devices authorized under Part 74 of the Commission's Rules to operate on a secondary basis in the TV broadcasting and other spectrum.[3] Wireless microphones have successfully operated, on a secondary basis, on unassigned channels in the TV spectrum for decades. Wireless microphone use has grown rapidly and today, they provide critical

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[1] *In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, FCC 14-49 (rel. April 23, 2014) ("*FNPRM*").

[2] "Wireless microphones" as used in this document incudes microphones, intercoms and in-ear monitors.

[3] Wireless microphones have historically operated on a secondary basis principally in the UHF television bands pursuant to Subpart H of Part 74. See 47 CFR §§ 74.801-74.882. Certain wireless microphone applications have also been accommodated on a secondary basis in the VHF television bands, in a narrow Part 90 VHF allocation, and in certain Industrial, Scientific and Medical bands under Part 15 unlicensed rules.

support to a wide range of sectors including TV broadcasting, news casting, theater, live music, sports, religious, civic and academic institutions.

While wireless microphone use has rapidly expanded over the past few decades, the soaring demand for spectrum for wireless broadband uses has prompted the Commission to takes steps to repurpose a significant amount of spectrum previously available for wireless microphones to high power wireless broadband.[4] Those steps have crowded wireless microphone operations into less and less spectrum raising the real possibility that some events simply will not be able to be supported in the future unless the Commission identifies sharing approaches and *additional* spectrum to supplement the available TV band spectrum suitable for low power microphone uses. In that context, Shure has participated extensively in various Commission proceedings grappling with the existing and growing spectrum needs of wireless microphones, such as ET Docket 04-186 (the "White Spaces Proceeding"), which established a database-driven sharing scheme that would allow new devices as well as incumbent wireless microphones to share TV spectrum, and the Commission's Broadcast Incentive Auction in GN docket No. 12-268.[5]

Shure has considered the 3.5 GHz band and determined that certain low-power wireless microphone products could be developed to successfully operate in that band

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[4] *See, e.g., Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 60 CR 497, at ¶ 24 (2014) ("*Incentive Auction Order*") (clarifying that the Commission "will also initiate a proceeding in the near future to find additional spectrum for microphone users in other bands in order to help address their long-term needs").

[5] Shure's contributions on spectrum-related issues affecting wireless microphones are reflected in numerous seminal FCC decisions. *See, e.g.*, Incentive Auction Order, at ¶ 300 (citing to Shure's comments when addressing the importance of wireless microphones to the creation of multimedia content); *see also Unlicensed Operation in the TV Broadcast Bands*, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807 (2008) (discussing throughout Shure's contributions to the development of spectrum sharing technologies).

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without material risk to incumbent users or Priority Access users provided that suitable technical and operational parameters are adopted. Shure is optimistic that with the modest changes to the proposals outlined herein, the rules adopted in this proceeding would enable the development of new innovative wireless microphone product lines operating in the 3.5 GHz band, thus providing an additional source of spectrum for rapidly expanding wireless microphone operations.

II. The Spectrum Access Service (SAS) Should Provide Flexible Spectrum Assignments

A. General Authorized Access (GAA) Users Should Have Access to Flexible Amounts of Spectrum

Shure agrees that the proposed new 3.5 GHz Citizens Broadband Service represents a valuable opportunity to promote a diverse array of low-power technologies that have the potential to drive significant productivity and efficient spectrum use.[6] Based on the technical and operational features proposed in the FNPRM, Shure envisions that the GAA spectrum could support certain wireless microphone applications if the rules provide for sufficient flexibility. In that regard, the Commission seeks input on whether the SAS should be allowed to assign a flexible amount of bandwidth to individual GAA users or whether a consistent amount (*e.g.*, ten (10) MHz) should be assigned.[7] Shure supports the proposed assignment of flexible amounts of bandwidth to GAA users. In the Professional Wireless Audio market, where Shure provides product solutions (*e.g.*, wireless microphones, in-ear monitoring, conferencing solutions, etc.), the number of wireless audio channels needed for a given event can vary widely from a

[6] *See FNPRM* at ¶2.
[7] *See FNPRM* at ¶35.

handful (<10) to dozens to hundreds of channels for larger, more complex events. Shure foresees the possibility that products in the 3.5 GHz band could be developed that may be scalable in bandwidth from a few MHz to twenty (20) MHz (or possibly more), depending on how many wireless audio channels are needed for a particular event. Allowing for flexible bandwidth assignment should enable the SAS to more efficiently share the available GAA bandwidth amongst more users in a given geographic area.

B. GAA Users Should Be Able To Select From Available Frequencies

Shure further urges the Commission to ensure that GAA users will have maximum flexibility in choosing frequency assignments. In particular, the Commission should clarify that a GAA user should be able to select any frequency that is available for GAA use in a particular geographic area -- much like the TV White Space database providers do in the TV broadcast frequencies -- leaving it up to the GAA user to decide which subset of that spectrum it will use. This approach is preferable to a more rigid approach wherein the SAS responds to its request for e.g., five (5) MHz by identifying a specific assignment (*e.g.*, 3600-3605 MHz).

Furthermore, Shure suggests that the SAS should be required to include the capability to offer more spectrum to a GAA user operating at lower power levels due to the lower interference potential to other users. For this purpose, the SAS could recognize a device's lower operating power parameters based on its device identifier sent to the SAS.[8] For example, the Commission has found that wireless microphones operating with a power of 50 mW or less pose a low risk of interference to licensed broadcasting services in the TV bands and has authorized them to operate on an unlicensed basis in

[8] *See also infra* Section III.B regarding Shure's proposal to adopt tiered Exclusion Zones.

those bands. Similarly, in the 3.5 GHz band, a conducted power limit of +20 dBm and a Power Spectral Density limit of +10 dBm/MHz could be applied for low power operation.

III. The Commission Should Adopt Rules that Minimize Exclusion Zone Coverage

A. The Commission Should Look to Reduce the Size of Exclusion Zones

As stated several times in the text of this FNPRM, the Exclusion Zones outlined in the NTIA Fast Track Report[9] were based on assumptions about PAL and GAA user power levels that have been significantly reduced in this FNPRM.[10] The initial development of proposed Exclusion Zones assumed that interference protection was needed against high power macrocell networks rather than the lower power small cell technology now envisioned by the Commission. Reducing the power of operations in the 3.5 GHz band opens the opportunity to shrink the size of the Exclusion Zones necessary to protect incumbent users while freeing up much needed spectrum for new uses. For that reason, Shure fully supports a reexamination of the proposed Exclusion Zones to determine whether the contemplated reduced output power requirements would enable the Exclusion Zones to be reduced while still providing adequate interference protection to incumbent users prior to issuing final rules.

B. The Commission Should Adopt A Tiered Approach to Exclusion Zones To Open More Spectrum for Lower Power Operations

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[9] *See U.S. Department of Commerce, An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands* (Oct. 2010) available at http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf (last visited July 14, 2014).

[10] *See FNPRM* at ¶¶ 138-140. "The Fast Track Report calculated exclusion zones based on a specific modeling approach with a number of assumptions, including especially the use of high-power, high tower WiMAX base stations, However, our proposal for the 3.5 GHz Band is based on the use of low-power small cell devices. This use case may require much smaller exclusion zones."

Shure further recommends that the Commission explore a tiered Exclusion Zone approach whereby the standard Exclusion Zones would apply only to Priority Access and GAA users operating under the currently envisioned rules, but smaller Exclusion Zones would apply to certain classes of Priority Access or GAA devices operating pursuant to lower power limits. This approach would allow lower power devices to operate inside the standard Exclusion Zones with reduced separation requirements from federal incumbents. For example, the Commission could create a low interference potential device ("LIPD") classification that establishes a reduced conducted output power limit of +20 dBm and a Power Spectral Density limit of +10 dBm/MHz. Such devices would be able to operate in all areas outside smaller Exclusions Zones without risk of interference to incumbents. This more granular approach to Exclusion Zones would free up more spectrum and create greater opportunities for a wide variety of devices with different maximum output powers to operate effectively in the 3.5 GHz band without risk of interference to incumbents.

IV. Indoor Wireless Microphone Use Should Qualify for a Contained Access Facilities Designation

The Commission sought input on whether it should permit certain classes of users to take advantage of even greater frequency reuse that becomes possible with the radiofrequency isolation intrinsic to contained access indoor environments. Specifically, the FNPRM asks whether certain users should be able to reserve frequencies (up to twenty (20) MHz) from the GAA pool for indoor use within their own facilities. According to the FNPRM, "the limited geographic and spectral impact of this proposal

will allow for the effective coexistence of Contained Access Users, Incumbent users and other Citizens Broadband Radio Service operators. "[11]

Wireless microphone users have a long history and extensive experience in taking advantage of indoor environments to enhance frequency reuse for low power devices in order to make the greatest use of available spectrum for as many devices as possible. [12] Accordingly, in response to the Commission's request for input on what types of entities should be considered Contained Access Users, Shure recommends that the Commission consider granting CAF status and access to wireless microphone users within the confines of their respective venues (*e.g.*, concert halls, theaters, conferencing facilities, houses of worship, etc.).

V. The SAS Should Compute CPSD Boundaries With Other Co-channel Priority Access or GAA Users

The FNPRM poses a number of questions regarding the rules required for the SAS to perform proper frequency assignments and interference management.[13] For that purpose, the Commission proposes a signal level threshold along Priority Access service area boundaries between different CBRS users. Shure notes that the operator of a low power CBRS device will probably not be able to determine where the boundaries of its service area are with respect to other co-channel Priority Access or GAA users. Therefore, Shure proposes that the Commission's Rules should make clear that it is the responsibility of the SAS to compute and enforce this restriction.

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[11] *FNPRM* at ¶ 60.

[12] Hundreds of microphones may be coordinated and operated inside a large convention center (*e.g.*, 2014 Detroit Auto Show) or at large-scale corporate events (*e.g.*, Fortune 100 annual shareholders meeting)

[13] *See FNPRM* at ¶ 79.

VI. Definitive Clarification Needed on Out-of-Band Emission Limit Test Measurements

The Commission "propose[s] to apply the limit of 43 + 10 log (P), which is equivalent to –13 dBm / MHz, to all emissions outside of channel assignments and frequency authorizations by SAS in the 3.5 GHz Band," and seeks "comment on this limit and whether it should be more stringent."[14] Shure does not object to the 43 + 10 log (P) limit, but does seek clarification as to how this limit will be implemented. Specifically, Shure seeks clarification that the Commission proposes to apply the 43 + 10 log (P) limit to power spectral density ("PSD") so that a device operating at +14 dBm/MHz (-16 dBW/MHz) would require 27 dB of attenuation to -13 dBm/MHz.

Based on historical guidance provided from OET, a PSD measurement is appropriate when the applicable rule part specifies the reference bandwidth for measuring unwanted emission levels.[15] Given that in the situation proposed rule Section 96.38(d)(3)(i) specifies "a resolution bandwidth of 1 megahertz or greater"[16] when evaluating the 43 + 10 log (P) limit, Shure would expect a device operating at +14 dBm/MHz (-16 dBW/MHz) to require 27 dB of attenuation to satisfy FCC emission limits for a CBSD. Definitive clarification from the Commission is desired on this measurement.

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14 *FNPRM* at ¶ 81.

15 *See* OET KDB 971168 v02r01 - Section 6.0.

16 *FNPRM* at Appendix A - Proposed Rules.

V. CONCLUSION

Shure supports the Commission's efforts to develop rules that will promote innovation and new low power small cell spectrum uses, on a shared basis, in the 3.5 GHz band. Consistent with that goal, the rule modifications that Shure suggests herein, if adopted, would serve the public interest by creating additional new spectrum resources that could be used for certain wireless microphone applications at a time in which demand for wireless microphone operations is increasing and existing spectrum resources are shrinking.

Respectfully submitted,

/s/_____

Catherine Wang
Tim Bransford
Bingham McCutchen LLP
2020 K Street, N.W.
Washington, DC 20006
(202) 373-6000
(202) 373-6001 (Fax)
catherine.wang@bingham.com
timothy.bransford@bingham.com

Counsel to Shure Incorporated

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