

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of	)	
	)	
Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band	)	WT Docket No. 08-166
	)	
Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition	)	WT Docket No. 08-167
	)	
Amendment of Parts 15, 74 and 90 of the Commission's Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones	)	ET Docket No. 10-24
	)	

To: The Commission

**COMMENTS OF SHURE INCORPORATED**

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## TABLE OF CONTENTS

	<u>Page</u>
Summary.....	iii
I. The Part 74 Rules Should be Updated to Reflect and Protect Current Wireless Audio Uses While Making Way for New Uses to Coexist.....	2
A. Shure Supports Expansion of the List of Entities Eligible for Part 74 Licenses .....	3
B. Licenses Should Be Available for “Professional” Use in These Locations. Recreational and Nonprofessional Use Should Not Be Eligible For FCC Licenses.....	6
C. How Should License Eligibility Be Determined?.....	7
D. License Eligibility Should Not Be Determined By Facility Size.....	7
E. The Commission Cannot Assume that Channels Below Channel 21 Offer Reliable Interference-Free Spectrum to Wireless Microphone Users .....	9
F. The Commission’s Rules Should Not Specify Particular Entities That May Seek a License.....	11
G. Professional Users Are Competent to Interact With the Database. Artificial Registration or Spectrum Limits Should Not Be Imposed. ....	12
H. Ten-Year License Terms Should Designated. The Application Process Should Be Updated and Streamlined to Encourage Compliance .....	14
II. Onerous Marketing Restrictions Should Not be Applied to and Enforced Against Manufacturers and Manufacturers Should Not Be Held Accountable for Users .....	15
A. Additional Device Labeling Requirements Should Not Be Imposed.....	17
B. Package Labeling and Customer Advisories are the Most Effective Means of Informing Consumers of Wireless Microphone Use Limitations.....	17
III. Unlicensed Wireless Microphone Operation Under Part 15.....	19
A. The Commission Should Allow Wireless Microphones to Operate on an Unlicensed Basis in the TV Bands Under Part 15.....	19
B. Technical Distinctions and Separate Authorizations for Equipment Operating Under Parts 74 and Part 15 Should be Avoided. ....	19
C. Equipment Transition, If Necessary, Should Be No Less Than 3 Years.....	21
D. Definition of Wireless Audio Devices: Prohibition of Data Transmission and Network Interconnection .....	21
E. Specific Technical and Operational Parameters of WADs .....	22
F. Wireless Audio Devices Must be Able to Operate on Channels 14-20 and Other Core TV Bands Without Unnecessary Restrictions if the Commission Wants to Encourage WAD Use.....	25
IV. Innovation and Efficiency Can Be Encouraged Without Compromising The Superior Audio Quality of Wireless Microphones .....	26
A. The Performance and Reliability of Professional Wireless Microphones is Unrivalled and Must Not be Degraded .....	26
B. Techniques that Improved Efficiency for Portable Wireless Devices Held to Lower Performance Standards Do NOT Apply to Wireless Microphones.....	27
C. The Commission Rules Can Augment Industry Efforts to Improve Efficiency By Adopting the ETSI Emission Masks for Digital and Analog Wireless Microphones .....	29

TABLE OF CONTENTS  
(continued)

Page

D.	Part 90 Rules Will Not Support Professional Wireless Microphone Applications Without Significant Changes.....	30
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## Summary

Shure applauds the Commission's initiative to address the extensive and varied uses currently being made of wireless microphone audio technology and shares the Commission's goal of updating the wireless microphone rules with an eye toward integrating new proposed uses with existing ones in the core TV band. High-quality wireless microphones have been in use for more than three decades in this country and are now an essential feature of professional sound production in many contexts that provide significant economic, cultural, spiritual, civic and educational benefits to the public. Wireless microphones are important to virtually every genre of music, live theater, news, sports, religious worship, education, business, and government. The uses that have developed over the years reflect a success generated by technical innovation and the public's demand for pristine sound in both live events and recorded media. Audio quality is a priority in these contexts and users rely on wireless microphones for reliable, crystal clear audio that is free from dropouts, static, delay, or other artifacts of interference.

While Shure welcomes the opportunity to update and refine the rules to match current production standards and technical advances, it notes that this proceeding comes on the heels of two Commission actions which have had a dramatic impact on the wireless microphone community: the mandate that users cease operating 700 MHz equipment in a short time frame without access to any replacement spectrum, and the White Spaces order in which the Commission permitted new devices to operate in the core TV band. The rules regarding interference protection developed in this proceeding will be critical to wireless microphone users given that wired equipment cannot be substituted, there is no suitable alternative spectrum, and wireless microphone users were recently banned from a significant portion of spectrum that had been available for many years.

As the Commission develops new rules that will divide wireless microphone users into two camps -- those whose operations will be protected from interference from new devices and those that must operate with the risk of unpredictable and potentially devastating interference -- Shure strongly recommends that the Commission make Part 74 licenses, and registration in the geolocation database, available for "professional uses", including those in which audio is an integral part of the performance or presentation of a for-profit or tax exempt not-for-profit activity at nine enumerated types of venues. Recreational or nonprofessional users should not be licensed but should be able to satisfy their audio requirements through wireless microphone equipment operating on an unlicensed Part 15 basis.

The Commission should not adopt eligibility criteria based on venue seating capacity, physical building dimensions, or the like, because those measures do not necessarily correlate to the need for interference protection. This is especially important given that the Commission cannot assume that TV channels 14-20 will offer interference-free spectrum to wireless microphone users that may not qualify for a license. Further, the Commission need not and should not specify which entities involved in a production may obtain a license. Depending on the event, the rental company that is responsible for supplying and operating the equipment may be the appropriate licensee rather than the venue itself.

Shure also urges the Commission not to adopt requirements that would charge manufacturers with the unusual responsibility of regulating the operations of other entities. Such a requirement would be onerous and ineffective given that manufacturers are not in a position to determine eligibility, pre-screen retail customers, or verify how customers intend to use products. Instead, the Commission should implement its new rules through consumer information alerts and packaging label requirements.

From the manufacturing perspective, there is no reason for the Commission to adopt different technical requirements for wireless microphone equipment other than an operational power limit for Part 15 users. Given the identical technical requirements and function, the Commission should not impose unnecessary costs and delays on manufacturers by requiring separate Part 74 and Part 15 equipment authorizations. If the Commission does adopt different technical requirements for Part 15 wireless microphones, it should specify a transition period of at least 3 years to implement the new requirements.

Finally, looking ahead, Shure strongly cautions against rule amendments that would attempt to promote spectral efficiency with measures used in other contexts such as narrowbanding or digital modulation. While suitable for other types of devices, they are incompatible with the Commission's goal of improving spectral efficiency in light of the user's requirement for real-time high quality audio. However, the Commission can foster important gains in spectral efficiency by adopting the European Telecommunications Standards Institute (ETSI) emission masks for analog and digital transmission that substantially reduce the permissible out-of-band emissions of a wireless microphone. Shure also encourages the Commission to consider changes to its Part 90 rules, namely to increase occupied bandwidth, provide interference protection, and identify additional spectrum that could position Part 90 as an alternative means of supporting wireless microphone operations.

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To: The Commission

**COMMENTS OF SHURE INCORPORATED**

Shure Incorporated ("Shure"), by its undersigned counsel, hereby submits these Comments in response to the Further Notice of Proposed Rulemaking ("Further Notice") released January 15, 2010, in the above-captioned matter regarding various issues relating to low power auxiliary stations, including wireless microphones. Shure applauds the Commission's initiative to address the extensive and varied uses currently being made of wireless microphone audio technology and shares the Commission's goal of updating the wireless microphone rules with an eye toward integrating prospective new uses in the core TV band with existing uses.

For nearly 85 years, Shure has been a respected U.S. manufacturer of high-quality, innovative audio products. Today, headquartered in Niles, Illinois, Shure is a global leader in audio electronics, including professional wireless microphone audio products. Shure recognizes that the Commission is faced with the difficult challenge of updating its rules pertaining to an incredibly successful wireless service that has flourished for decades without government intervention and far outgrown the Commission's initial provisions, all the while preserving the opportunity for new devices to operate in the same spectrum. While Shure welcomes the effort to update and refine the wireless microphone rules, the Commission's proposal comes on the heels of two other important actions imposing dramatic changes on

the wireless microphone industry. First, in the same document, the Commission ordered all 700 MHz wireless microphone operations to cease within five months and without replacement spectrum identified, despite Commission Rules that supported such operations for more than 30 years -- an unprecedented “transition” on any industry or service.<sup>1</sup> Second, the Commission recently completed its “white spaces” proceeding -- a highly technical and contested proceeding in which the Commission established rules that would permit new devices *yet to be developed* to operate in TV band spectrum.<sup>2</sup> Although the Commission firmly stated from the beginning and throughout the “white spaces” proceeding that its intent was to unlock the value of unused spectrum and that new rules would not cause disruption or permit interference to incumbent uses, the Further Notice in this proceeding now raises the issue of whether the updated wireless microphone rules developed in this proceeding should permit what could be devastating interference to at least some wireless microphone operations.

Based on decades of real-world experience in developing wireless audio technologies and working with the ever-increasing demand for more innovative, reliable, efficient wireless audio technology, Shure sets forth below a number of specific recommendations regarding wireless microphone licensing, interference protection, equipment marketing, equipment authorization, and technical rules that, if adopted, will balance the need to protect existing uses (and the millions of Americans who benefit from them) while retaining the opportunity for new uses to be made of vacant spectrum.

#### **I. The Part 74 Rules Should be Updated to Reflect and Protect Current Wireless Audio Uses While Making Way for New Uses to Coexist**

The Commission’s existing Part 74 rules concerning wireless microphone licensing eligibility were authored in 1977 and have been the subject of only one minor update in the more than 30 years since they were originally issued.<sup>3</sup> When the rules were promulgated, the predominant use of wireless

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<sup>1</sup> See Amendment of Parts 15, 74 and 90 of the Commission’s Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones, *Report and Order and Further Notice of Proposed Rulemaking*, FCC 10-16 (Rel. Jan. 15, 2010) (“*Further Notice*”).

<sup>2</sup> See Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, *Second Report and Order and Memorandum Opinion and Order*, 23 FCC Rcd 16807, 16862 (rel. Nov. 14, 2008) (“*White Spaces Order*”) *recons. pending*.

<sup>3</sup> See Amendment of Part 2 and Subpart D, Part 74 of the Commission’s Rules and Regulations with Respect to the Use of Wireless Microphones, *Report, Memorandum Opinion and Order*, 63 FCC 2d 535 (rel. Mar. 8, 1977). (“*VHF Wireless Microphone Order*”).

microphones was in support of content for broadcast production. Several important changes have occurred in the more than 30 years since the Commission last addressed these rules. First, the quality and sophistication of audio and video production have dramatically evolved. Due to technology advancements in audio, video and distribution methods, as well as increased audience demand for sophisticated, innovative, yet flawless production, today's productions cannot be compared to the relatively rudimentary standards of the 1970s. It is an uncontested fact that high-quality wireless audio devices, including wireless microphones, are now an essential feature in many walks of American life and are not limited to content production for conventional TV broadcasting.<sup>4</sup> These developments should be viewed as a success generated by technology innovation -- not a roadblock to it -- and the desire to meet public demand.

The Commission's Rules have not kept pace with actual usage, demand and innovation in wireless audio technology. Accordingly, the purpose of reforming the Part 74 rules should be to update the rules to reflect the state-of-the-art use with an eye toward integrating new proposed uses of spectrum with the existing ones. The purpose should NOT be to discredit and restrict existing uses, impair or create barriers to existing uses, and otherwise squelch the innovation that has produced many public benefits for more than three decades. Shure cautions the Commission against choosing technology winners and losers or defining, explicitly or implicitly, "good" innovation and "bad" innovation, particularly with regard to prospective new products and/or services versus current ones.

#### **A. Shure Supports Expansion of the List of Entities Eligible for Part 74 Licenses**

It is a fact today that wireless microphones<sup>5</sup> are an integral part of the audio infrastructure of any modern professional production. The use of this wireless audio cannot easily be reduced to a specific purpose, which perhaps was not the case when the rules were first introduced and the use was predominately for broadcast content production. Today, wireless microphones are an essential feature of professional sound production in multiple contexts that provide economic, cultural, spiritual, civic and

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<sup>4</sup> Thanks to multiple new transport mechanisms, consumers have access to video and audio programming from multiple sources, such as live Internet video streaming, Internet Protocol Television (IPTV), direct broadcast satellite video, to name a few. See, e.g., Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, *Thirteenth Annual Report*, 24 FCC Rcd 542 at ¶ 24 (rel. Jan. 16, 2009).

<sup>5</sup> Throughout this document, "wireless microphones" are defined to include microphones, intercoms and in-ear monitors.

educational value. The record in this proceeding and the White Spaces proceeding is replete with input from professional users across many segments, including performing artists in virtually every genre of music, live theater, sports, large and small houses of worship from virtually all denominations, educational institutions, commercial, government and business conference facilities -- all attesting to the current use and future need for interference-free wireless microphone systems.<sup>6</sup>

The scope of today's wireless microphone use bears repeating in order to highlight that the stakes *for existing users* are extremely high in this proceeding. Investments have been made and users have relied on the flawless performance of their professional wireless sound systems for many years. No suitable alternative exists. Wired systems cannot replace this functionality. Additionally, many wireless microphone users are already laboring under the financial imposition of the Commission's recent decision to close off the 700 MHz spectrum to professional microphone use -- a decision that has dealt a hard financial blow to many cultural, religious, and educational users who have been forced to scrap existing systems (most of which still work perfectly well). Most importantly, as discussed below and regardless of unamortized 700 MHz equipment investments, no suitable alternative spectrum exists to support the state-of-the-art wireless microphone system designs and usage patterns required for these professional applications.

Today, wireless microphones are used extensively by TV broadcasters, but they are also integral to musical performances, live theater, sporting events, religious services, business conferences, and educational lectures, among other uses not related to broadcast content. The Commission has long been aware of the use of wireless microphones by nonbroadcast entities.<sup>7</sup> The Commission has issued Part 74

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<sup>6</sup> See, e.g., Comments of MGM MIRAGE, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1-4 (filed Feb. 23, 2010); Comments of Second Baptist Church, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24 at 1-2 (filed Feb. 26, 2010); Comments of Central Synagogue, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1-2 (filed Feb. 12, 2010); Comments of Phil Ramone, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1-2 (filed Feb. 24, 2010); Comments of US Airways Center, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1 (filed Feb. 17, 2010); Comments of The Senate of The State of Texas, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1-3 (filed Feb. 17, 2010); Comments of Macalester College, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1 (filed Feb. 16, 2010); Comments of Andre Pessis, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1 (filed Feb. 19, 2010); Comments of Yerba Buena Center for the Arts, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1 (filed Feb. 22, 2010); Comments of Kenneth "Babyface" Edmonds, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, at 1 (filed Feb. 19, 2010); Letter from Sports Technology Alliance to Chairman Kevin J. Martin, *Ex Parte* in ET Docket Nos. 04-186, 02-380 (filed Aug. 21, 2008); Letter from Charlotte St. Martin, Executive Director, The Broadway League, to Chairman Kevin J. Martin, *Ex Parte* in ET Docket No. 04-186 (filed June 10, 2008).

<sup>7</sup> As the Commission observed "wireless microphones are typically used in settings such as lecture halls, auditoriums and theaters. Station Identification for Part 90 Wireless Microphone Use, *Order*, 8 FCC Rcd 15 at ¶ 3 (Jul. 19, 1993).

licenses for some of these uses.<sup>8</sup> Shure believes that some wireless microphone users have not obtained FCC licenses because the Commission's rules identify a class of users eligible for licensing that is too narrow and the Commission's licensing process is out of date and overly complex and burdensome for the intended purpose. This expanded use of wireless audio technology in which microphone operators have acted responsibly in frequency selection and coordination has occurred with virtually no reported instances of interference to licensed services.

If the Commission decides to proceed with its plan to create two classes of microphone users -- one class comprised of lower power unlicensed users under Part 15 who must suffer from interference from White Space devices and accept a limitation on power usage,<sup>9</sup> and another class of licensed users that will be accorded interference protection and which may operate at power levels up to 250 mW<sup>10</sup> -- Shure strongly supports an expansion of the class of entities eligible to obtain Part 74 licenses. If the Commission implements its proposed two class scheme and does not update and expand the list of Part 74 eligibles, the actual and potential interference to wireless microphone systems will wreak havoc with professional productions in every sector mentioned.

We believe it would be in the public interest to protect professional uses of wireless audio technology from interference in the significant contexts mentioned above. We therefore recommend that the Commission extend Part 74 licensing eligibility to professional users at the following sites:

- Indoor and Outdoor Seated Facilities including Amphitheatres, Arenas and Stadiums
- Theaters
- Outdoor Entertainment Venues Including Sites with Lawn Seating, Amusement Parks and Fairgrounds
- Convention Centers and Business Conference Facilities

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<sup>8</sup> See, e.g., Boeing Company Radio Station Authorization, Call Sign BLP00928 (granted May, 16, 1994); Spokane Falls Community College Radio Station Authorization, Call Sign BLP01469 (granted Jun. 24, 1998); Kansas City Youth For Christ, Inc. Radio Station Authorization, Call Sign BLP01470 (granted Nov. 16, 2005); Gloria Del Church Radio Station Authorization, Call Sign BLP01186 (granted Oct. 2, 1996); High Street United Methodist Church Radio Station Authorization, Call Sign BLP00022 (granted Aug. 27, 1979); MGM Grand Hotel Las Vegas Inc. Radio Station Authorization, Call Sign BLP01475 (granted Jul. 26, 2006); Goodyear Tire & Rubber Company Radio Station Authorization, Call Sign WPPG800 (granted Sep. 22, 2005); University of Oklahoma Football Radio Station Authorization, Call Sign WPTA515 (granted Apr. 13, 2006); Disneyland Resort Radio Station Authorization, Call Sign WPTR571 (granted Nov. 29, 2001).

<sup>9</sup> See *Further Notice* at ¶¶ 107, 116, 146.

<sup>10</sup> *Id.* at ¶¶ 18, 108, 116; see also 47 C.F.R. § 75.861(e)(1).

- Educational and Cultural Facilities, including Schools and Museums
- Governmental Facilities
- Houses of Worship
- Lodging Facilities and Entertainment Venues
- Audio and Video Recording Studios<sup>11</sup>

**B. Licenses Should Be Available for “Professional” Use in These Locations. Recreational and Nonprofessional Use Should Not Be Eligible For FCC Licenses**

Shure proposes that Part 74 license eligibility should be extended to “professional users” as specifically defined below and not to recreational and nonprofessional users of wireless microphones. For these purposes, we suggest that the Commission define “Professional” uses to include uses in which audio is an integral part of the performance or presentation of a for-profit activity or a not-for-profit entity whose operations are exempt from taxes under Section 501(c)(3) of the Internal Revenue Code.<sup>12</sup> Under this definition, examples of uses for which Part 74 licenses would be available include music concerts, professional sports, live theater, trade shows and business conferences, as well as religious services, educational presentations, collegiate sports, and government meetings undertaken at any of the nine listed locations.<sup>13</sup> Recreational and nonprofessional users should not be included in the licensing rules because their audio needs do not require the type of performance that a licensed Professional user requires. Recreational and nonprofessional users generally do not make a comparable level of investment in sophisticated sound systems and do not have an expectation, or an audience expectation, of flawless operation. Recreational and nonprofessional users will be able to satisfy their wireless audio requirements with relatively minimal equipment and spectrum use. Moreover, a recreational or nonprofessional user would rarely need wireless microphones to transmit over longer distances and would

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<sup>11</sup> Shure does not object to the request to use low power auxiliary stations inside nuclear power plants. (See *Further Notice* at ¶ 139). These facilities are generally well-isolated from residential areas and even most commercial areas. The proposed use would be supervised by trained personnel. Therefore, the possibility of interference to other licensed users would be low.

<sup>12</sup> 26 U.S.C. § 501(c)(3) identifies various organizations qualifying for tax-exempt status, including religious, educational, national amateur sports competitions.

<sup>13</sup> If the Commission decides that nuclear power utilities should have the opportunity to rely on wireless microphones free from interference, the Commission’s rules should specify nuclear power plants and nuclear power plant operations as locations and uses eligible for Part 74 licensing.

not otherwise need microphones with higher power levels. Finally, under this proposed standard, in Shure's experience, all entities that would qualify for licensing would likely have engaged a professional facilities, technology, or frequency coordinator who would be responsible for wireless microphone operation at these venues and who would likely be responsible for frequency selection and registration in the geolocation database.<sup>14</sup> As is the case today, these individuals will have the training, experience, resources and professional purpose to comply with frequency selection and coordination requirements.<sup>15</sup>

### **C. How Should License Eligibility Be Determined?**

The Commission asks how to distinguish between those users that will be eligible for licensing, and presumably registration for interference protection in the geolocation database, and those who will be required to operate on a noninterference basis subject to power limits under Part 15.<sup>16</sup> The Further Notice identifies several possible attributes that could be a condition for licensing including size of the facility, number of seats, or number of channels used. Shure strongly cautions against attempting to adopt a "bright line" test for license eligibility. Such a test may be easy to codify but it will impose arbitrary cut offs, generate questionable results requiring additional interpretation, and be quickly rendered obsolete by usage and technology trends. Shure believes that consumer information and technical parameters developed in this proceeding will effectively ensure that only eligible Professional users will seek licenses and be subject to the rights and obligations attendant with licensed status.

### **D. License Eligibility Should Not Be Determined By Facility Size**

We strongly support the expansion of the licensing eligibility list to include facilities such as concert halls, amphitheaters, theaters, entertainment complexes, sporting arenas, religious facilities, convention centers, and other sites listed above. These locations are designed with the intent to host professionally produced large gatherings (for a variety of purposes) and, in our experience, those sites almost always require multiple wireless systems and the flexibility to use higher power wireless

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<sup>14</sup> See *White Spaces Order* at ¶ 199.

<sup>15</sup> See, e.g., MGM MIRAGE Comments at 3; Rickey Minor Comments at 1; James Stoffo Comments at 1-2; US Airways Center Comments at 1; Willow Creek Community Church Comments at 1; Cedarville University Comments at 1.

<sup>16</sup> See *Further Notice* at ¶ 131.

equipment. In Shure's experience, modern productions in many of these facilities can rival or exceed the sophistication and technology demands of many conventional broadcast uses, even in facilities that are not hosting music or other traditional entertainment productions, such as conventions centers, trade shows, or cultural events.

We believe that it would be unworkable and not in the public interest to impose specific venue size requirements on licensing eligibility. The number of seats or dimensions within a facility do not necessarily correlate to the extent and nature of wireless audio use in the facility or the rationale for ensuring protection for the facility. The Commission has suggested that smaller facilities may need only one or two TV channels and therefore they do not need a license because they have the option of selecting a vacant channel rather than "reserving" one through the database.<sup>17</sup>

Although it is true that some smaller facilities do not require as many wireless systems as larger ones, in many cases, what may be described as a smaller facility may be relying on such wireless audio for critical interference-free operation. Speeches at conferences, lectures in classrooms, performances in certain live music and theater productions and recording studios are examples of these uses. Further, there are live venues in most major cities with historical significance or industry recognition that routinely host nationally known performers and utilize the same array of wireless equipment that they would deploy at a stadium venue.<sup>18</sup> Protection against interference (e.g., high audio quality) may be imperative based on the nature of the function -- regardless of the facility size -- particularly if these events are recorded or transmitted live to remote audiences. If the Commission decides that only licensed users are entitled to interference protection, then it is critical that these users are able to obtain a license regardless of seating capacity, building size, or location.<sup>19</sup>

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<sup>17</sup> See *Further Notice* at ¶ 129.

<sup>18</sup> Several "smaller" venues routinely hosts live artists that perform in larger venues in other locales. Examples are the 9:30 club in Washington, DC, the CBGB club in New York, New York, The Troubadour club in Los Angeles, California, The Birchmere in Alexandria, Virginia, Victory Grill in Austin, Texas, and Walnut Street Theatre in Philadelphia, Pennsylvania.

<sup>19</sup> Although Shure believes that an eligibility condition based on the number of seats and/or physical dimensions of a building in which a wireless microphone system is used would not serve the public interest for the above reasons, if the Commission nonetheless determines that it is imperative to rely on a seating metric for eligibility, it should consider following the **50-seat** standard used for accessible design and assistive listening system requirements set forth in the Americans With Disabilities Act ("ADA"). The ADA provides that assistive listening requirements apply to ". . . assembly areas where audible communications are integral to the use of the space (e.g., concert and lecture halls, playhouses and movie theaters, meeting rooms, etc.). Such assembly areas, if (1) they accommodate at least 50 persons, or if they have audio-amplification systems, and (2) they have fixed seating, . . . [shall have a permanently installed system]" 28 C.F.R. Pt. 36, app. A at 4.1.3(b) (emphasis added.)

**E. The Commission Cannot Assume that Channels Below Channel 21 Offer Reliable Interference-Free Spectrum to Wireless Microphone Users**

The Commission has suggested both in the Further Notice and in the White Spaces Order that interference-free spectrum is available below Channel 21 for wireless microphone operations that require only one or two TV channels.<sup>20</sup> However, the availability of interference-free channels for wireless microphones in TV Channels 14- 21 is far from certain.<sup>21</sup> We therefore caution the Commission against adopting restrictive license eligibility rules on the assumption that microphone users will be able to access clear channels below Channel 21 to meet their spectrum needs.

The FCC's White Spaces Order established that below Channel 21 portable white space devices would not operate and higher power, fixed TVBDs would not be permitted to operate on channels adjacent to assigned TV channels.<sup>22</sup> The Commission reasoned that this combination of rules would ensure that some open spectrum that is free from TVBD interference would always be available in channels below Channel 21.<sup>23</sup> That clear spectrum, it was assumed, would adequately accommodate wireless microphones that were not registered in the database for whatever reason, for example roving news trucks for which it would not be practical to reserve frequencies in advance.<sup>24</sup> However, the Commission recognized that in 13 cities where public safety had been assigned frequencies between Channels 14-21 there may not be sufficient available interference free-spectrum for wireless microphones. For that reason, the Commission ruled that two channels would be made available in the UHF spectrum surrounding Channel 37 in those 13 markets to ensure that wireless microphones have some reliable interference free channels to use.<sup>25</sup> (In reality, only 11 such cities exist.)

Unfortunately, this approach does not in fact ensure that adequate interference-free spectrum will always be available for wireless microphone operations that are not registered in the database. The

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<sup>20</sup> See *Further Notice*, at ¶ 111; see *White Spaces Order* at ¶¶ 1, 157.

<sup>21</sup> Channels below Channel 14 are not good options for wireless microphone operations. Longer wavelengths in VHF frequencies below channel 14 have inferior propagation characteristics relative to UHF frequencies for the purpose of transmitting from the modest antennas that can be fitted to handheld and bodypack microphones.

<sup>22</sup> See *White Spaces Order* at ¶ 10.

<sup>23</sup> See *id.* at ¶ 157.

<sup>24</sup> *Id.*

<sup>25</sup> See *White Spaces Order* at ¶¶ 1, 157.

Commission's order did not address or propose a solution for those cities where *no* adjacent or designated protected channels exist. Examples of such cities include Minneapolis, Minnesota, the 15th ranked TV market, Portland, Oregon, the 23rd ranked TV market, and Memphis, Tennessee, the 44th ranked TV market in the United States. These markets have no "adjacent channels" in TV Channels 14-20 because they have no occupied TV channels in that range. Moreover, these cities are not on the list of 13 cities in which Part 90 public safety operations exist and where two protected channels on either side of TV channel 37 will be designated as free from white space device interference. Therefore, these cities have NO protected channels on which wireless microphone users not protected by the database can rely. In fact, just looking at the top 50 television markets in the United States, there are significant gaps in the availability of adequate -- or any, in the three named markets -- interference-free channels in Channels 14-21:

<u>0 protected channels:</u>	<u>Ranking in top TV markets</u> <sup>26</sup>	Metro Pop. <u>CENSUS</u>	<u>Nielsen</u> <sup>27</sup>
Minneapolis-St. Paul, MN	15	382,605	1,732,050
Portland, OR	23	557,706	1,188,770
Memphis, TN	50	669,651	667,660

  

<u>1 protected channel:</u>	<u>Ranking in top TV markets</u>	Metro Pop. <u>CENSUS</u>	<u>Nielsen</u>
Atlanta, GA	8	537,958	2,387,520
Seattle-Tacoma, WA	13	795,722	1,833,990
Sacramento-Stockton-Modesto, CA	20	953,798	1,404,580
Salt Lake City, UT	31	181,698	944,060
Harrisburg-Lancaster-Lebanon-York, PA	39	165,968	743,420
Buffalo, NY	52	270,919	633,220

This sampling includes major cities of significant populations and economic activity. These are areas of substantial wireless microphone use for cultural, entertainment, business, sports, religious, educational, government, and other purposes. The Commission's Rules provide no adequate alternative to license protection for interference-free microphone operation in these cities. Thus, wireless microphone user groups that are excluded from license eligibility and interference protection in the amended rules will

<sup>26</sup> Nielsen, *Local Television Market Universe Estimates, Comparisons of 2008-09 and 2009-10 Market Ranks* (2009), available at <http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/08/2009-2010-dma-ranks.pdf>.

<sup>27</sup> *Id.*

have no option in Minneapolis, Portland and Memphis and no adequate option in the other cities for uninterrupted, interference free transmissions. Further, no adequate channel protection will be available for nonlicensed users in Atlanta, the eighth largest TV market in the United States, home to the historic Alliance Theatre, the Atlanta Symphony Orchestra and the Georgia Aquarium, the world's largest aquarium, or Seattle-Tacoma, the thirteenth largest TV market, home to the historic Paramount Theatre, Museum of Flight or the Experience Music Project Museum. These significant cultural and educational venues, which typically use multiple channels for wireless audio during events, will likely be substantially impaired if the rules do not allow Part 74 license protection for interference-free operations.

**F. The Commission's Rules Should Not Specify Particular Entities That May Seek a License**

Shure recommends that the entities involved in the Professional uses described above be eligible to obtain Part 74 licenses. Who the licensed entity should be for any particular event will vary and therefore Shure recommends that the Commission's Rules retain adequate flexibility regarding the specific entity that must hold a Part 74 license or in order to be the registrant in the geolocation database for the event. The licensed entity for an event may be the venue owner or operator, but it could also be the event producer, the responsible technical engineer, the event sponsor, or the performer. Many facilities do not own their own equipment. In such cases, the coordinator of the frequency information would be the company supplying the rented sound equipment for the event. Therefore license eligibility should be extended to them for the purpose of accurate geolocation database entries.

It is common for many users to outsource their wireless audio needs by engaging a rental "house." There are numerous significant rental "houses" in the United States that serve a wide variety of users -- including many broadcasting networks -- who require wireless audio for many different functions. Such companies typically have experienced technicians and skilled operational staff who act as the frequency or technology coordinator for particular events. We propose that rental companies be permitted but not be required to obtain an FCC license (as mentioned, other parties involved in an event may be the holder of the Part 74 license). This provision would reflect that a rental house meets the attributes for a Professional, rather than recreational or nonprofessional user, has personnel with significant technical expertise and understanding of wireless audio operations and obligations, and will often be the party responsible for making frequency selections and frequency coordination. It would often be more efficient

for the rental house to have license status when managing the wireless audio needs of an eligible entity that has outsourced its wireless audio operations.

The role of the touring production company in multi-city music tours illustrates why, in some cases, a rental “house” is the most logical entity to maintain a Part 74 license. Planning a multi-city music tour starts with the artists and their agents working with promoters and venue operators to plan schedules, locations, ticket prices, budgets and all other details of who will perform and when, where, and at what cost the tour will take place. “How” a tour will take place and executing the individual shows is left to the production company engaged for the tour. Among many other things, the production company is responsible for surveying the audio needs of the tour based on the artists’ needs, the planned performances, and the planned locations. Typically, the production company owns a significant inventory of audio equipment and supplies the equipment necessary to meet the tour’s audio needs along with the various sound engineers that will travel with the tour to manage and operate the sound system. In this scenario, which is typical for major music tours and many theater tours, the venue operator does not own or provide the audio equipment or operate the equipment used in the performance, and neither the artists nor the promoters own or operate the equipment. Further, it is unlikely that specific equipment identified in a venue owner’s Part 74 license would cover the particular mix of equipment that the tour operator has decided to use for the event.<sup>28</sup> Rather, it is the “rental” company engaged for the tour that is responsible for -- and by far the most knowledgeable about -- the equipment and its operation and who is therefore the logical entity to hold the Part 74 license in that situation. In a Bruce Springsteen concert at the Verizon Center, it will be the production company that is in charge of the audio equipment; not the musicians and not the Verizon Center management.

**G. Professional Users Are Competent to Interact With the Database. Artificial Registration or Spectrum Limits Should Not Be Imposed.**

The Further Notice asks for input on how newly eligible wireless microphone users could interact with the TV Band Device database, and how the Commission’s rules may help ensure that database reservations are made only for the times actually needed and not made in a manner that would block

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<sup>28</sup> FCC Form 601 used for Part 74 wireless microphone licensing requires that applicants specifically identify the make and model of equipment, power output, tunable frequency range and number of units.

access to the spectrum.<sup>29</sup> The Further Notice also asks whether newly eligible users will be able to comply with all of the Part 74 requirements that apply to existing eligibles, such as the requirement to coordinate frequencies, and whether the FCC should place any additional requirements or limitations, for example, on the amount of spectrum that can be used in a given location by the newly eligible users.<sup>30</sup>

We anticipate that wireless microphone use would be protected at locations where they are in regular use, as the Commission decided in the White Spaces Order.<sup>31</sup> Shure proposes that such licensed use be limited to Professional uses (as defined above), specifically excluding recreational and nonprofessional uses. This classification contemplates that licensed users by definition will have sufficient technical expertise and staff to comply with the Part 74 requirements. In this regard, the Commission should be aware that frequency coordination and interference avoidance have been handled consistently and effectively by professional users for many years, regardless of license status, and without the aid of regulatory intervention and management.<sup>32</sup>

The details of the online geolocation database have not been fully established yet and therefore the specific procedure that a licensee will follow to update information concerning dates and times of operation cannot be determined at this time.<sup>33</sup> However, Shure believes that it is important for the Commission to require the database to operate on a quasi real-time basis, ensuring that changes made to the time and location of a “reserved” frequency are implemented immediately in the database.<sup>34</sup> If the database were required to operate in quasi real-time basis, then there would be little incentive for registrants to “over-reserve” frequencies in order to accommodate any possible last minute changes in wireless microphone operations. Conversely, if the database is only updated once a day, users may be motivated to “block out” groups of frequencies that they might or might not use, depending on operating contingencies revealed close to the event. Requiring real time updates would go a long way toward ensuring more efficient spectrum use.

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<sup>29</sup> See *Further Notice* at ¶ 133.

<sup>30</sup> See *id.* at ¶ 132.

<sup>31</sup> See *id.* ¶ 18; *White Spaces Order* at ¶ 198.

<sup>32</sup> See, e.g., MGM MIRAGE Comments at 1-4.

<sup>33</sup> See *Office of Engineering and Technology Invites Proposals from Entities Seeking to be Designated TV Band Device Database Managers*, Public Notice, ET Docket No. 04-186, DA 09-2479 (Nov. 25, 2009) (“*Database Administrator RFP*”).

<sup>34</sup> See Shure Petition for Reconsideration in ET Docket Nos. 04-186, 02-380 at 15 (filed Mar. 19, 2009).

Shure does not support specific time or spectrum limits or restrictions on advance registration because the database will need to serve wireless microphone use in a variety of situations and such limits may be inconsistent with actual needs. Users that have ongoing spectrum needs -- such as the National Football League -- that are planned in advance should be able to enter those reservations in the database for a period of up to one year in advance. Advance reservations help not only licensed users, but also unlicensed users, to plan spectrum availability on a longer term basis.<sup>35</sup>

**H. Ten-Year License Terms Should Designated. The Application Process Should Be Updated and Streamlined to Encourage Compliance**

The Further Notice seeks input on the length of initial and renewal license terms for wireless microphone users obtaining licenses under the revised rules.<sup>36</sup> We encourage the Commission to revisit the license terms as part of a general overhaul of the licensing procedure for wireless microphones. We recommend that wireless microphone license terms be for a specific period of time from date of issuance rather than being tied to the license terms for broadcasting stations in a particular area. This change would simplify the requirements and reflect that not all wireless microphone operations are related to local broadcasting operations. We also note that some existing licenses are for nationwide or regional areas and a simple license term, consistent with other services, would be easier for Commission staff and licensees to track. We believe that a license term of 10 years would be appropriate for all wireless microphone licensees.

A separate but related issue is the need to modernize and streamline the licensing process for wireless microphones. The existing process is burdensome to the point where it is beyond the ability of most users to file an application without expending significant time and resources to complete the application. The Commission's application materials for wireless licenses are inordinately complex and require information that serves no regulatory purpose.<sup>37</sup> As a practical matter, as discussed above, it is

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<sup>35</sup> If the Commission deems it necessary, the rules could require users to confirm their advance reservations that have already been entered within a certain period, similar to confirming a flight reservation.

<sup>36</sup> See *Further Notice* at ¶¶ 137-138.

<sup>37</sup> We note that the Part 74 wireless microphone application materials are the same materials used to license a regional cellular system or microwave relays, both of which are much higher power systems, have significantly greater geographic reach and entail more extensive infrastructure. Much of the material in the 9 pages of instructions and approximately 163 fields in the application is irrelevant to a wireless microphone license, in that fact, there is no explicit references to wireless microphones in the application. As a result, a prospective applicant must commit

common for a professional production to use rented equipment the selection and mix of which will depend on the needs of the particular event, preference of the users, availability, and other factors completely unrelated to the equipment specified on the license of any party involved.

Shure believes that the excessively complex and burdensome licensing process has deterred at least some currently eligible users from applying for a license. If licensing eligibility is expanded, it will certainly be in the interest of the Commission as well as the public to streamline and update the licensing process.<sup>38</sup>

## **II. Onerous Marketing Restrictions Should Not be Applied to and Enforced Against Manufacturers and Manufacturers Should Not Be Held Accountable for Users**

The Further Notice seeks comment on whether manufacturers should be subject to wireless microphone marketing restrictions and held responsible for violations through revocation of equipment certifications. Shure strongly opposes imposing marketing restrictions on equipment manufacturers that would essentially require them to step into the shoes of the Commission and administer operational rules that pertain to other entities. Such a requirement would depart from long held regulatory approach which recognizes that the responsibility for compliance with *operational* licensing issues appropriately rests with the *operators* of equipment -- not equipment manufacturers. As a general rule, the Commission has not delegated its responsibility to equipment manufacturers to police implementation of operational requirements in the market.<sup>39</sup> Manufacturers are primarily responsible for developing and producing

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significant time and money just to sort out the required information required to be provided. Shure has recommended microphones be subject to blanket licensing by "rule." Shure has recommended microphones be subject to blanket licensing by "rule." See Shure Comments, WT Docket Nos. 08-166, 08-167 at 23 (filed Oct. 3, 2008). However, if individual licensing is required, Shure recommends that the existing licensing process be updated and significantly streamlined.

<sup>38</sup> For instance, applicants using FCC Form 601 must enter the make and model number of microphones, power output, emission designators, tunable frequency range, and number of units. See FCC 601 Main Form, *FCC Application for Radio Service Authorization* (2010), <http://www.fcc.gov/Forms/Form601/601main.pdf>; FCC 601 Schedule H, *Technical Data Schedule for the Private Land Mobile and Land Mobile Broadcast Auxiliary Radio Services* (2010), <http://www.fcc.gov/Forms/Form601/601h.pdf>. In terms of technical information and operational specifications, Shure believes that applicants should be asked to specify only the type of equipment (e.g., wireless microphone, monitor, cue and control), the tunable frequency range, the maximum power output of the devices, and the number of units. If the devices are to be used only at a particular location, then applicants should specify the location by address or area around geographic coordinate.

<sup>39</sup> The Commission has rarely required manufacturers to enforce licensing or operational requirements and situations in which it has imposed such requirements are clearly distinguishable from the sale and operation of wireless microphones. For example, in establishing the rules for demodulator products to effectuate the ATSC flag system, the Commission adopted rules that a demodulator not incorporated into a consumer product or transport stream processor could only be sold if the equipment manufacturer obtained a written commitment from a buyer that

equipment that meets the technical requirements of the Commission's Rules and compliance with appropriate testing and equipment authorization procedures.

Regardless of whether the Commission amends its rules to expand the class of eligible Part 74 entities, manufacturers are in no position to assess whether an entity is eligible for a license under the rules. Manufacturers simply do not know who will operate the equipment, and how, when, where or for what purpose the equipment will be used.

Imposition of onerous point of sale restrictions would be unmanageable and ineffective. Shure, like many other manufacturers of wireless microphones and other equipment, does not sell equipment on a retail basis.<sup>40</sup> End users may review the website of the manufacturer for product information and sometimes interact with customer service to ask questions about the equipment or get help in troubleshooting, but this in no way functions as a pre-sale screening of potential license eligibility.

Even if manufacturers were in contact with end users, they cannot determine eligibility based on the *type* of entity. Under existing rules, for example, the Commission has granted Part 74 licenses to a wide range of non-broadcast entities – including houses of worship, hotels and convention centers, athletic departments, universities, and manufacturing corporations.<sup>41</sup> These grants demonstrate that it is not simply the nature of the entity that is the basis for Part 74 license eligibility. Whether a particular entity is eligible for Part 74, like all licensing decisions, requires the exercise of the Commission's judgment and authority.

Finally, while Shure does not speak for other manufacturers, it is not equipped to make licensing decisions and does not want the delegated authority or responsibility to render such decisions for other entities. Such a rule would place manufacturers in the inappropriate and untenable position of making

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they would only use the equipment in consumer products or would only sell such equipment to another user who would operate and use it in compliance with the rules. Digital Broadcast Content Protection, *Report and Order*, 18 FCC Rcd 23550, ¶¶ 42-47 (2003). This strict control on the sale and operation of demodulation equipment was necessary to ensure that individuals could not circumvent the purpose of the broadcast flag to "limit the indiscriminate redistribution of digital broadcast content." *Id.* at ¶ 12. Unlike demodulators, which can be used to profit from the violation of another entity's rights, wireless microphone operation does not present such inherent dangers or potential for abuse. Similarly, marketing and sale limitations imposed upon ultra-wideband devices is limited since such equipment is used for sensitive public safety and law enforcement purposes and these devices also can have large bandwidth emissions that can reach one gigahertz. See *Revision* of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, *Report and Order*, 17 FCC Rcd 7435 (2002). There are no such issues related to the manufacture and sale of wireless microphones to justify imposing enforcement and verification responsibilities upon the manufacturers.

<sup>40</sup> Other than a very few exceptions for specialized custom made equipment.

<sup>41</sup> See footnote 7, *infra*, listing examples of Part 74 licenses for a variety of users.

regulatory decisions regarding the status of others without the necessary information or authority and at significant risk potential to its own equipment authorizations.

**A. Additional Device Labeling Requirements Should Not Be Imposed**

The Further Notice asks whether manufacturers should be required to provide a label visible at the time of purchase on the device advising of the requirements to obtain a license, and/or whether instruction manuals should be required to contain advisory information about the licensing requirements (and if so what language should apply).<sup>42</sup> Shure does not object to requirements to place an advisory label on the product packaging, similar to the one that the Commission has required for the interim provisions for unlicensed operation.<sup>43</sup> Shure would also support a requirement to include advisory information in device manuals if the Commission found such a legal requirement to be necessary. However, Shure opposes a requirement for device labeling that goes beyond current requirements as impractical and burdensome. Wireless microphones are generally small devices -- some, such as body packs, are extremely small -- and it would be very difficult to include additional text on a microphone. Information regarding licensing requirements is only relevant at the transaction, not each time the product is used (such as with electric shock or other safety precautions); therefore labeling requirements on packaging are sufficient and need not extend to the physical product.

**B. Package Labeling and Customer Advisories are the Most Effective Means of Informing Consumers of Wireless Microphone Use Limitations**

The Further Notice also asks what, if any, responsibility should manufacturers, retailers, and distributors have to notify customers about the licensing requirements and what, if any, steps should be required at the point of sale.<sup>44</sup> The Commission also asks for input on a variety of potential manufacturer requirements, including requirements to obtain written user commitments that the party is a *bona fide* reseller or a party eligible to be a Part 74 licensee, possibly to be retained for two years, a facility identification number associated with a Commission license, or some other form of identification which

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<sup>42</sup> *Further Notice* at ¶ 143.

<sup>43</sup> *Id.* at ¶¶ 98, 101.

<sup>44</sup> *Id.* at ¶ 144.

shows that the purchaser is a licensee or record keeping requirements for manufacturers to track to whom their products are marketed, or to ensure that these devices are marketed in a manner that is consistent with the restrictions on their use.<sup>45</sup>

Shure believes that providing users information at point of sale including, as discussed, package labeling and customer advisories in equipment manuals is the most direct, effective and appropriate method to administer the Commission's amended rules. The Commission should not adopt other rules that would impose unprecedented and burdensome due diligence and paperwork requirements on manufacturers and retailers as a means to regulate the user community. Such requirements are impractical and would burden these parties with significant costs for personnel training for new systems and procedures, developing new recordkeeping systems, complying with privacy laws triggered by new records retention and the delays associated with customer confusion over new purchasing procedures. As discussed above, manufacturers usually do not have direct contact with users, cannot track the location of customers, have no reliable way of assessing eligibility, and have no way of confirming the use of the equipment. As such, the requirements mentioned in the Further Notice would impose unreasonable burdens on manufacturers and would do little to ensure user compliance. For retailers and distributors, these requirements would not apply to any other category of product they are likely to carry, and would thus constitute a unique effort and expense. Accordingly, the Commission should not impose requirements on manufacturers, retailers and distributors beyond the package labeling and consumer advisories previously discussed.

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<sup>45</sup>

*Id.*

### III. Unlicensed Wireless Microphone Operation Under Part 15

#### A. The Commission Should Allow Wireless Microphones to Operate on an Unlicensed Basis in the TV Bands Under Part 15

As the Commission suggested, unlicensed operation at a low power level (e.g. 50 mW) on an unprotected basis may be a useful option for those who are unable to qualify for a Part 74 license, but who still require the use of wireless audio technology.<sup>46</sup> In Shure's view, the users that fit the Part 15 model are recreational and nonprofessional users. Those users generally do not need higher power equipment intended for professional applications and do not have expectations, or audience expectations, for flawless professional performance. Although Shure agrees that many users may need only a small number of wireless microphones operating simultaneously, and only one or two vacant TV channels may be required for such situations, users cannot be assured that clear channels will be available in every market for the reasons discussed in Section 1.E above. Shure disagrees with the Commission's assumption that operation on a "non-licensed basis in the TV bands under Part 15 of the rules may meet the needs of the vast majority of wireless microphone users."<sup>47</sup> Accordingly, the envisioned Part 15 operations will not be adequate to support users that may have a need for only one or two channels where that user must have reliable interference-free channels, albeit for fewer channels. Shure believes that Part 15 non-licensed operations will accommodate the vast majority of *recreational and nonprofessional* users but will not suffice for Professional users that require a small number of interference-free channels.

#### B. Technical Distinctions and Separate Authorizations for Equipment Operating Under Parts 74 and Part 15 Should be Avoided

**Technical Distinctions Inhibit Manufacturing Efficiencies.** Commission, consumer and manufacturer interests will be served if the technical differences between equipment operating under Part 74 and devices operating on a Part 15 basis are minimized. The principal technical distinction in the Commission's proposal is a limitation to 50 mW for Part 15 operations. No other technical distinctions appear necessary. Wireless audio manufacturers will want to capture development and fabrication

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<sup>46</sup> FCC Form 601 used for Part 74 wireless microphone licensing requires that applicants specifically identify the make and model of equipment, power output, tunable frequency range and number of units. See FCC 601 Main Form, *FCC Application for Radio Service Authorization* (2010), <http://www.fcc.gov/Forms/Form601/601main.pdf>; FCC 601 Schedule H, *Technical Data Schedule for the Private Land Mobile and Land Mobile Broadcast Auxiliary Radio Services* (2010), <http://www.fcc.gov/Forms/Form601/601h.pdf>

<sup>47</sup> *Further Notice* at ¶ 111.

efficiencies in manufacturing products meant for Part 74 and Part 15 operation by building a single set of products and making minor adjustments, for example to the power output, as opposed to developing entirely separate lines of products for Part 74 and Part 15 users.<sup>48</sup> Unless absolutely necessary to the Commission's policies, no further technical distinctions should be imposed as it will be difficult to justify the development costs of designing a different set of products for licensed and unlicensed operations.

**Separate Equipment Authorization Requirements Impose Unnecessary Practical Burdens.**

The Commission proposes to place the new requirements for unlicensed Wireless Audio Devices in Part 15, Subpart C of the rules and require manufacturers to obtain separate product certifications under Part 15 and Part 74.<sup>49</sup> Shure urges the Commission not to impose authorization requirements under multiple sets of technical rules in different sections of the Commission's Rules when the purpose, function and technical specifications of the equipment are essentially identical. Given the near identical production and technical requirements for wireless microphones operating under Part 74 and Part 15, manufacturers should not be burdened with the unnecessary yet significant expense, delays and administrative responsibility to acquire and maintain two authorizations under separate rule parts.<sup>50</sup> Shure recommends that the technical rules be maintained in one section, preferably Part 74, with appropriate provisions for different kinds of operation (e.g., the 50 mW power limit for unlicensed operation).

Shure strongly believes that the Commission should implement its rules for unlicensed operation by referencing the Part 74 technical rules from within Part 15, and by adding a subsection to Section 74.861 that specifies a maximum conducted RF output power of 50 mW for operation in the TV bands under Part 15 of the Commission's Rules. All other technical rules for wireless microphones as "Low Power Auxiliary Stations" should remain under Part 74 of the Commission's Rules. Products certified under Part 74 that are able to be operated at or below the 50 mW limit should be automatically compliant under Part 15 (as well as Part 74). After a transition period (discussed below), product labels will need to be updated to indicate to the user that the product complies with Parts 15 and 74. Higher powered

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<sup>48</sup> From the manufacturing standpoint, differences in output power requirements are relatively easy to address in producing a single product design.

<sup>49</sup> See *Further Notice* ¶ 142.

<sup>50</sup> Generally, when approvals are required under multiple rule parts separate test procedures are required, adding time and expense for manufacturers. Even if the test requirements are similar, separate test reports must usually be generated, which is a significant part of the approval cost and takes additional time.

products that are already certified under Part 74 should retain their existing certification, and new products would be certified under Part 74 (only), or both Parts 15 and 74 as appropriate. Users would be required to operate at the appropriate power level. This approach is similar to the one in Europe where a common standard applies to all operations in different countries and national directives specify frequency and power output limits that apply in specific circumstances.

**C. Equipment Transition, If Necessary, Should Be No Less Than 3 Years**

In the wireless microphone industry, a typical design and manufacturing cycle takes 3-5 years for wireless microphone products, a longer time period than typically applies to consumer products. In the event that the Commission decides to adopt different technical and equipment authorization requirements for wireless microphones operating under Part 74 and devices operating under Part 15, Shure proposes that the Commission provide for a transition period of no less than 3 years from the date of the order.

**D. Definition of Wireless Audio Devices: Prohibition of Data Transmission and Network Interconnection**

Shure generally agrees with the Commission's proposed definition of Wireless Audio Devices ("WADs") under Part 15 as intentional radiators used to transmit voice, music or other audio material over short distances using either analog or digital modulation techniques.<sup>51</sup> Shure also supports the prohibition of data transmissions other than short data strings such as recognition codes necessary to ensure the functionality of a system.<sup>52</sup> However, this prohibition should be further qualified. Digital wireless audio transmitters transmit the audio signal as a continuous digital data stream and therefore the prohibition should not apply to digital audio data. In addition, some wireless microphone systems transmit certain data either continuously or on a continuously periodic basis, such as battery condition information, that should be expressly permitted. The prohibition should not apply to the *length* of the data string but rather should limit data transmission to secondary uses such as to support system functionality.

The Further Notice also proposes a prohibition on interconnection with the public switched telephone network and private networks to prevent these devices from being used as telephone headsets,

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<sup>51</sup> See Shure Petition for Reconsideration in ET Docket Nos. 04-186, 02-380 at 15 (filed Mar. 19, 2009).

<sup>52</sup> See *Further Notice* at ¶ 112.

cordless phones and the like.<sup>53</sup> Although Shure is not aware of any existing applications for wireless microphones where they are being used in that manner to connect directly to the public switched telephone network (PSTN), wireless microphones are often used in corporate or government installations as part of an audio or video conferencing system, which in turn is connected to the PSTN or other network. In other applications, the wireless audio device might provide an audio feed to a telephone interface or to a public or private wireless network to send audio programming back to the studio of a broadcasting station. Thus, prohibiting the transmission of audio material to such networks would significantly limit the utility of wireless audio devices. To avoid this, the rules should prohibit wireless audio devices operating under Part 15 to have a built-in interface that allows a direct connection to the PSTN. This condition would permit devices that feed into another device, such as an audio mixer, that connects to the PSTN to relay program material back to a studio.

The Further Notice asks how precisely the rules should define WADs and whether other specifications or restrictions are needed, such as limiting devices to one-way operation.<sup>54</sup> The Commission should not adopt this restriction because it would restrict a very significant existing class of wireless microphone equipment that provides two-way audio connectivity, such as IFB systems and voice intercom systems. Shure is concerned that if the Commission attempts to strictly limit the applicability of the rules to specific situations, it would unintentionally block new and innovative applications for wireless audio devices. At the same time, Shure recognizes it is imperative that the Commission's rules do not allow or invite the proliferation of unlicensed devices whose use and applications are such that they would likely cause interference with licensed wireless microphones and other incumbents.

#### **E. Specific Technical and Operational Parameters of WADs**

**Separation Distances:** The Further Notice proposes that Part 15 Wireless Audio Devices will be permitted to operate in the core TV bands spectrum on channels 2-51<sup>55</sup> and not permitted to operate co-channel with TV stations using the same separation distances required for Part 74 wireless

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<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> See *Id.* at ¶ 115. Excluding channel 37 nationwide and channel 17 in Hawaii which are allocated for non-broadcast purposes.

microphones.<sup>56</sup> In this regard, Shure notes that the existing separation distances fail to distinguish between various classes of TV stations, such as full-power, Class A, and Low Power; yet it is clear that these have significantly different protected contours and should have different separation criteria. In light of the need to maximize spectrum use, we encourage the Commission to revisit these separations, and if possible, to designate shorter separation distances for lower power TV stations.

**Power Output Level and Amplifier Restrictions:** The Further Notice proposes that WADs be designed to operate with a power level to the antenna of up to 50 mW in both the VHF and UHF TV bands. The Commission also asks whether the rules should prevent component parts such as amplifiers from being attached after market to a microphone and whether the rules should specify a maximum field strength or other emission limits for equipment.<sup>57</sup>

Shure supports the proposed power level but cautions against a flat prohibition on the use of amplifiers. A power level of 50 mW to the antenna can provide a useful working range for wireless microphones in the absence of interference. It is important to understand that the ability to maximize the efficiency of wireless microphone antennas is constrained by the fact that they are physically small and they are detuned when placed close to the body. Thus, the field strength of a wireless microphone transmitter could be as much as 20 dB lower when it is held in the hand or worn on the body than when measured in a test chamber. By contrast, in-ear monitor systems suffer attenuation where the received signal is attenuated by the body.<sup>58</sup> To overcome these problems, directional antennas are often used to improve the link margin for the system. The use of active antenna combiners is also common for multi-channel in-ear monitor setups. This reduces the number of antennas that must be deployed, but more importantly, it also reduces interference caused by Intermodulation Distortion (IMD), which is important for maximizing spectral efficiency. Antenna combiners do not significantly change the signal level, although they do contain amplifiers. Accordingly, while Shure supports the 50 milliwatt power level for unlicensed operation, it would be problematic if directional antennas or antenna combiners were prohibited, since these are very important tools that enable greater use of existing spectrum without interference.

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<sup>56</sup> *Id.*

<sup>57</sup> *See id.* at ¶ 115.

<sup>58</sup> These systems also typically use stereo multiplex transmission, which suffers from an additional 13 dB noise penalty in comparison to monophonic transmission.

### **Channelization, Frequency Stability, Bandwidth, Out-of-Band Emissions, Frequency**

**Tolerance:** The Further Notice proposes for WADs the same channelization, frequency stability, bandwidth and out of band emission requirements as exists under Part 74.<sup>59</sup> Shure supports this proposal but encourages the Commission to consider adopting ETSI emission mask requirements<sup>60</sup> as a means to foster greater spectrum efficiency. See Section IV.C *infra*. The Commission also proposes that operation be offset from the upper or lower channel edge by 25 kHz or an integral multiple thereof, that the operating frequency tolerance be 0.005%, that one or more adjacent 25 kHz segments within a TV channel may be combined to form an operating channel with a maximum bandwidth not to exceed 200 kHz, that the frequency tolerance be maintained over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, for a variation in the supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C, and that battery operated equipment be tested using a new battery.<sup>61</sup> Shure supports the adoption of these technical requirements.

**WADs Should Not Be Subject to TV Band Devices Requirements.** Shure agrees with the Commission's statement that the white spaces TV Band Device requirements are not suitable for Wireless Audio Devices.<sup>62</sup> In particular, TVBDs are required to have geolocation capability, and the ability to connect to the Internet to register with a central data base, as well as spectrum sensing capabilities. These features are incompatible with the real-time nature of wireless microphones and should not be imposed on WADs.

**Maximum Frequency Deviation Should Be Eliminated:** The Further Notice asks whether any other technical requirements need to be specified for Wireless Audio Devices, and in particular whether devices operating under Part 15 should be subject to the maximum frequency deviation specification

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<sup>59</sup> See 47 C.F.R. § 74.802(c).

<sup>60</sup> See ETSI EN 300 422-1 V1.3.2 (2008-03) and EN 300 422-2 V1.2.2. (2008-03) ("*EN 300 422 Standard*")

<sup>61</sup> See *id.* at ¶ 117; see also 47 C.F.R. §§ 15.225(e), 15.229(d) and 15.231(d). The Commission expects that the proposed 25 kHz offset requirement would prevent wireless microphones from operating at the edge of a TV channel where they could interfere with TV stations on adjacent channels, and the proposed frequency tolerance requirement would ensure that devices do not drift from the designated frequencies. The limit on the bandwidth that a wireless microphone may occupy will leave room for multiple microphones within a channel.

<sup>62</sup> See, e.g., Complaint of Public Interest Spectrum Coalition (PISC) Against Shure Incorporated, Nady Systems, Inc., VocoPro, Audio2000, Sennheiser Electronic Corporation, Audix Microphones, Electro Voice, Hisonic International, Inc., Pyle Audio, *et al.*; Petition To Create a General Wireless Microphone Service (GWMS), *Informal Complaint and Petition for Rulemaking* at 8 (filed Jul. 16, 2008) (stating that houses of worship are "excluded from use of Part 74, Subpart H wireless microphones").

when frequency modulation is used.<sup>63</sup> Additionally, Part 74 states that a transmitter may be either frequency synthesized or crystal controlled.<sup>64</sup> Shure recommends that the maximum frequency deviation specification be eliminated (for both Part 74 and Part 15 wireless microphone equipment), in view of the fact that a maximum occupied bandwidth limit is more relevant; particularly on a going forward basis. Frequency modulation may be supplanted by other modulation types in the future. Today, most wireless microphones are frequency synthesized, but it is conceivable that future technologies might use other types of frequency control. There is no apparent need to stipulate the use of a particular technology, so long as the frequency tolerance requirements are met.

**F. Wireless Audio Devices Must be Able to Operate on Channels 14-20 and Other Core TV Bands Without Unnecessary Restrictions if the Commission Wants to Encourage WAD Use**

The Commission asks whether it should prohibit wireless audio devices operating under Part 15 from operating co-channel with land mobile stations on Channels 14-21 or adopt any other technical rules to prevent interference to land mobile stations.<sup>65</sup> No prohibition or further interference restriction to wireless microphones is necessary or advisable. The Commission has very effective rules already in place under Part 74 that prevent wireless microphones from interfering with land mobile radios and Shure has no objection to these rules applying to Part 15 WAD microphones.<sup>66</sup> However, if meaningful adoption of this new technology is to occur, the Commission must avoid further limiting WAD microphone operation on these channels. In the White Spaces Order, the Commission expressly identified these frequencies as well suited for long-term wireless microphone use.<sup>67</sup> Further regulating WAD microphone use of channels 14-20 would undermine the Commission's decision to promote wireless microphone operations on these frequencies, and generally hinder WAD microphone development.

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<sup>63</sup> See *id.* § 74.861(e)(3).

<sup>64</sup> See *id.* § 74.861(e)(2).

<sup>65</sup> *Id.* at ¶ 144

<sup>66</sup> *Id.*

<sup>67</sup> See *White Spaces Order* at ¶ 151.

#### **IV. Innovation and Efficiency Can Be Encouraged Without Compromising The Superior Audio Quality of Wireless Microphones**

Shure shares the Commission's goal to ensure that "spectrum is used efficiently and effectively by wireless microphones,"<sup>68</sup> and dedicates tremendous resources toward research and development efforts intended to advance wireless microphone technology. Shure also agrees that this proceeding presents a good opportunity to refresh the record and evaluate what steps the Commission can take to encourage "technological improvements" in wireless microphone technology.<sup>69</sup>

While sharing the Commission's long-term goals, Shure reminds the Commission that wireless microphone technology is truly unique and is held to a performance standard that, in certain respects, exceeds that of any other wireless, handheld device. Relative to other wireless handheld devices, wireless microphones have virtually no latency, wider and more accurate frequency response, and superior reliability. The Commission must be careful not to compromise this unparalleled performance in developing forward looking regulations.

##### **A. The Performance and Reliability of Professional Wireless Microphones is Unrivalled and Must Not be Degraded**

While other handheld devices (*e.g.*, mobile phones and Part 90 business radios) are only designed to convey intelligible voice communications, and only need to replicate the human voice with sufficient quality for the remote recipient to recognize and understand the communicated words, wireless microphones are precision, high-fidelity instruments that must capture and transmit the user's voice, musical instrumentation, and/or sound effects with exacting precision. The receiver output of a professional wireless microphone system should produce the exact sound that was input into the microphone transmitter by the performer, instrument or sound effect in real-time.

- Analog wireless microphones introduce an insignificant amount of latency into the transmission of the user's voice compared to 20-100 milliseconds for carrier grade wireless telecommunications equipment (*i.e.*, mobile phones). Very low latency is critical for live sound reinforcement applications and also for in-ear monitoring. State-of-the-art digital wireless microphones typically

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<sup>68</sup> *Further Notice* at ¶ 146.

<sup>69</sup> *Further Notice* at ¶ 149

exhibit a latency of 5 milliseconds or less which is satisfactory for some applications but unacceptable for many others.

- Wireless microphones are able to capture and transmit the human ear's full frequency response range. Professional wireless microphones typically have a bandwidth of 15-20 kHz, Carrier grade wireless telecommunications equipment generally only accommodate a fraction of this range (2-3 kHz), and fail to capture low- and high-range frequencies.<sup>70</sup> They are designed to provide intelligibility only, not faithful sound reproduction.

Any degradation in the performance of wireless microphones will render them unusable for professional applications. For example, an increase in latency will prevent wireless microphones from being used in stage and musical productions where singers and instruments must be synchronized and the introduction of more than a few milliseconds of delay will create a number of problematic acoustic effects that cannot be engineered around, including frequency interaction (the inadvertent mixing of amplified sound radiating from different sources, echoing, and disorienting "psycho-acoustic" effects. Degradation in sound quality is not only devastating to a live production but also to the recorded performance given that wireless microphones are at the front end of the recording process and the quality of the recordings are determined by the quality of the sound from the microphone.

#### **B. Techniques that Improved Efficiency for Portable Wireless Devices Held to Lower Performance Standards Do NOT Apply to Wireless Microphones**

The Commission must avoid the temptation to borrow techniques that worked in the past to improve wireless microphone innovation and efficiency. Wireless handheld devices that only transmit and receive basic voice communications are held to audio standards far below wireless microphones, and tolerate performance deficiencies that render microphones unusable. Improvements in wireless microphone innovation and technology cannot be accomplished with a "cookie cutter" approach.

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<sup>70</sup> The FCC actually limits frequency response for some FCC handheld voice transmitters. For example, Part 95 General Mobile Radio Service transmitters may not have audio frequency response that exceeds 3.125 kHz, a fraction of what is needed for a high-fidelity wireless microphone. See 47 C.F.R. § 95.637.

1. *The Commission Cannot Narrowband Wireless Microphone Emissions Without Seriously Degrading Performance*

Wireless microphones -- whether analog or digital -- require a 200 kHz channel to achieve high-fidelity audio quality. For either type of modulation, 200 kHz of occupied bandwidth is necessary to transmit a signal that captures the full frequency response range described above while maintaining a high signal-to-noise ratio and minimal latency. Further reductions in wireless microphone signal bandwidth would create fundamental performance problems and render wireless microphones unsuitable for use in professional applications. Specifically, narrower occupied bandwidth would necessitate the use of an excessive amount of audio compression resulting in audible artifacts. Many compression algorithms add significant latency during compression and decompression processing. As discussed in greater detail above, latency creates a number of acoustic problems that make digital wireless microphones unsuitable for certain musical and live stage applications. Furthermore, the need for additional processing power is at odds with the requirement to keep transmitter power consumption at minimal levels to prolong battery life.

2. *Mandating Digital Modulation Would Actually Hurt Efficiency*

Delivering high-fidelity audio using a digital modulation scheme actually takes more bandwidth, not less. The conversion of a high-fidelity signal into an uncompressed stream of bits actually requires much more than a 200 kHz wide channel. Getting a digital transmission to fit in a 200 kHz channel requires a significant amount of compression, with attendant losses in audio quality. In contrast, an analog signal has a narrow peak with significantly reduced signal strength measured at the edge of the 200 kHz emission, which contributes to reduced out-of-band emissions and generally superior spectral efficiency. The European Telecommunications Standards Institute (ETSI), which produces globally applicable standards for radio communication equipment, evaluated the spectrum needs of analog and digital microphones and reached the same conclusion -- digital microphones need a wider channel.<sup>71</sup> With regard to interference immunity, despite conventional wisdom that digital schemes are more robust, digital modulation is actually more susceptible to harmful interference relative to analog transmissions.

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<sup>71</sup> Among other internationally adopted wireless standards, ETSI is responsible for the development of Digital Enhanced Cordless Telecommunications (DECT) and Global System for Mobile Communications ("GSM"); See *EN 300 422 Standard*.

**C. The Commission Rules Can Augment Industry Efforts to Improve Efficiency By Adopting the ETSI Emission Masks for Digital and Analog Wireless Microphones**

The wireless microphone industry has made dramatic strides in recent years to advance the state of the art. A combination of targeted regulatory changes and continuing industry innovations would lead to marked improvements in spectrum efficiency.

The European Telecommunications Standards Institute (ETSI) has developed emission masks that dramatically reduce the permissible out-of-band emissions a wireless microphone can generate. To that end, Shure encourages the Commission to adopt the emission masks contained in the ETSI EN 300 422-1 V1.3.2 (2008-03) and EN 300 422-2 V1.2.2 (2008-03) harmonized standards. There are separate masks for analog and digital microphones, both of which could be adopted by the Commission without dedicating significant engineering resources toward the development of a completely new mask. Shure would support immediate adoption of both masks. While the nominal occupied bandwidth remains 200 kHz wide and is therefore capable of accommodating the same high-fidelity audio today's microphones support, at the edge of the emission the energy level drops far below levels permitted under the FCC's existing emission mask for Part 74 wireless microphones. Reduced out-of-band emissions would facilitate tighter spacing of wireless microphones operating together within a TV channel.

The other factor that limits the number of wireless microphones that can operate in a given amount of spectrum is intermodulation distortion (IMD), which mainly occurs when transmitters are placed in close proximity to each other. Shure continues to expend significant research and development resources on ways to reduce the effects of IMD, as well as other innovations that will improve wireless microphone efficiency.

Shure recommends adoption of the ETSI emission masks, but urges the Commission to proceed cautiously with regard to any other long-term regulatory changes and to avoid imposing regulations that degrade the performance of wireless microphones, such as rules that restrict the occupied bandwidth of wireless microphones. Such restrictions would likely inhibit the adoption of new digital transmission technologies.

**D. Part 90 Rules Will Not Support Professional Wireless Microphone Applications Without Significant Changes**

The Further Notice seeks comment on “steps the Commission should take to revise the Part 90 wireless microphone rules to make them more useful.”<sup>72</sup> Shure has previously manufactured Part 90 wireless microphones that operated in the VHF band and is not opposed to building microphones under Part 90 rules in the future if changes are made to accommodate improved performance and better interference protection.

Part 90 wireless microphones must have some form of protection to avoid interference from co-channel transmissions created by other FCC-authorized radio transmitters that are approved for the same frequencies. Users of Shure’s legacy Part 90 product line frequently reported incidents of harmful interference. Given that there is no mechanism to reserve frequencies under the existing Part 90 rules, this presents a problem that would be difficult for users to overcome. Unacceptable interference reported by customers was the main reason that Shure suspended development of Part 90 wireless microphone products. Extending Part 90 wireless microphone operations into new frequencies where channels can be reserved would be one alternative to overcome co-channel interference experienced on existing Part 90 wireless microphone frequencies. The limited number of channels (eight (8) 54 kHz wide channels) available for Part 90 wireless microphone operations are closely spaced and intermodulation distortion prevents the operation of more than 3 microphones at the same location at any given time. Making additional frequencies available for Part 90 wireless microphone operations would help alleviate this problem.

Further, the occupied bandwidth permitted under current Part 90 wireless microphone rules is too narrow to support professional operations and should be widened. The existing channels set aside for wireless microphones under Part 90 are only 54 kHz wide.<sup>73</sup> For the purpose of supporting high-fidelity audio, the Commission should widen the existing channels to 200 kHz, which is consistent with Part 74 wireless microphone operations and ETSI standards for analog and digital microphones. The technical requirements should be made identical to Part 74.

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<sup>72</sup> See *Further Notice* at ¶ 151.

<sup>73</sup> See 47 C.F.R. § 90.265.

Respectfully submitted,

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