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

REPLY COMMENTS OF
SENNHEISER ELECTRONIC CORPORATION

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Sennheiser Electronic Corporation ("Sennheiser")[1] files these reply comments in the above-captioned proceeding.[2]

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[1] Sennheiser Electronic Corporation is a wholly-owned subsidiary of Sennheiser electronic GmbH & Co. KG, headquartered in Germany. The parent company is a global leader in microphone technology, RF-wireless and infrared sound transmission, headphone transducer technology, and active noise cancellation. The U.S. subsidiary, based in Old Lyme, Connecticut, represents Sennheiser products in the United States and distributes a variety of other professional audio lines.

[2] *Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band*, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, Report and Order and Further Notice of Proposed Rulemaking, FCC 10-16 (released Jan. 15, 2010) ("Notice").

A. THE RECORD STRONGLY SUPPORTS EXPANDING ELIGIBILITY FOR WIRELESS MICROPHONES.

By far the bulk of the record in this proceeding consists of requests that the Commission authorize additional categories of wireless microphone users. There are letters from scores of individual churches and synagogues, professional theaters, performing arts groups, sound engineers, broadcast engineers, musicians, live concert producers, concert and sports venue operators, hotel and conference facility operators, independent record producers, audio production companies, Major League Baseball, the National Football League, the National Hockey League, NCAA, NASCAR, audio-visual service providers, recording artists, recording studios, audio equipment rental companies, children's entertainers, high schools, colleges, the John F. Kennedy Center for the Performing Arts, ESPN, News Corporation, the Recording Academy, AFTRA, the Grand Ole Opry, and the Texas State Senate.

The authors represent a broad cross-section of American economy and culture. Only a handful sent in form letters; the vast majority took the trouble to state their own views.

Although Motorola and the joint filing by the Association for Maximum Service Television, Inc. and the National Association of Broadcasters (MSTV/NAB) are hostile to *unlicensed* wireless microphones under Part 15, Sennheiser applauds their support of expanding *licensed* use to include (variously) theaters, live music producers, entertainment complexes, government bodies, sporting arenas, and houses of worship.[3]

[3] Motorola at 5-6; MSTV/NAB at 17.

1. Allegations that expanding Part 74 authority will "reward" manufacturers for "flouting the rules" are simply wrong.

The Public Interest Spectrum Coalition ("PISC") repeats its assertions that wireless microphone manufacturers "brazenly flouted Commission rules" and marketed wireless microphones illegally, and for that reason should not be "rewarded" with expanded eligibility.[4] Sennheiser has twice denied the charge of illegal marketing on the public record, and does so a third time here.[5] Sennheiser does not sell to ineligible users; and even if it did, that in itself would not violate any Commission rule. Unable to show that Sennheiser's denials are false or inadequate, PISC simply repeats its charges.

PISC also tries to argue that writing definitions for expanded Part 74 eligibility would be "wading into [a] morass of issues."[6] PISC underestimates the Commission's ability to draft clear, enforceable rules that would restrict licensing to appropriate users. The record already includes several concrete suggestions.[7]

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[4] Media Access Project, the New America Foundation, and Public Knowledge, on behalf of the Public Interest Spectrum Coalition ("PISC") at 6; *see also* Dell/Microsoft at 2 ("misleading marketing practices of several wireless microphone manufacturers").

[5] "Sennheiser sells only to distributors (including retailers), professional service providers, and large end users such as major movie and TV studios, whose eligibility is not in doubt. The company does not sell directly to consumers or small end users. Sennheiser has no retail outlets of its own. Its U.S. website does not accept orders for wireless microphones, but instead directs buyers to local dealers." Comments of Sennheiser Electronic Corporation at 8 (filed March 1, 2010). *See also* Comments of Sennheiser Electronic Corporation in WT Docket Nos. 08-166, 08-167 at 9 (filed Oct. 3, 2008) (similar).

[6] PISC at 7.

[7] *See* MSTV/NAB at 16-20; Motorola at 5-6; Shure at 3-8; Audio-Technica at 11-12; Sennheiser at 5-7.

2. The high public interest in wireless microphones supports expanding Part 74 eligibility.

Parties that favor TV Band Devices (TVBDs) seek to restrict wireless microphones so as to keep TV spectrum clear for the "vast benefits" and "incredible potential" of TVBDs.[8]

Sennheiser does not dispute the potential of TVBDs; but for now, potential is all they can claim. None exists, apart from a few experimental units. While advocates recite a list of applications – "affordable broadband access, wireless mesh networking, telemedicine applications, and countless services and applications yet to come"[9] – these remain wholly speculative.

Wireless microphones, in contrast, are delivering valuable benefits today, and have done so for decades. They play an indispensable role in the Nation's exercise of democracy, religious life, education, sports, culture, and many forms of entertainment, whether live, broadcast, recorded, or online, all with a history of zero interference to TV reception. TVBD advocates, while touting the wonders they hope TVBDs might achieve some day in the future, overlook the high level of public interest in wireless microphones today.

The same benefits of wireless microphones explain their non-licensed operation: not the result of manufacturers' marketing illegally, but because the devices fill important public needs that users cannot meet in any other way. TV band wireless microphones deliver excellent sound quality, high reliability, low drop-out rates, no latency, and adequate range and battery life. No alternative comes close. Those who need these qualities, including Broadway theaters, large churches, and outdoor live-music venues, simply have no workable alternative.

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[8] PISC at 3; Dell/Microsoft at 4. *See also* Spectrum Bridge at 3-4 (opposing expansion of Part 74 because that will leave less spectrum for TVBDs and complicate the database).

[9] Dell/Microsoft at 6.

B. THE COMMISSION SHOULD AUTHORIZE LOW-POWER WIRELESS MICROPHONES UNDER PART 15.

1. Properly regulated Part 15 wireless microphones will not cause harmful interference.

The Commission proposes to authorize unlicensed low-power wireless microphones under Part 15 as Wireless Audio Devices (WADs).[10] MSTV/NAB predicts this will set off "an explosion of . . . baby monitors, voice-controlled remote-controlled toys, wireless microphones for video game consoles, and wireless audio speakers and surround sound systems, . . . [plus] home intercom systems and wireless door bells . . . [plus] the plethora of future devices that are difficult to envision at this time."[11] It fears interference as a result.

This need not come to pass. Sennheiser supports a narrow definition for WADs so as to exclude the spurious applications that concern MSTV/NAB (and which could operate under the TVBD rules). For example, the following change to the Commission's proposed definition would eliminate everything on MSTV/NAB's list while retaining all intended uses:

> (hh) *Wireless Audio Device*. An intentional radiator that is used to transmit voice, music or other audio material over a short distance <u>as input to a public address system, recording device, broadcast facility, or dissemination over the Internet</u>. Transmissions may be either analog or digital. Data transmissions are not permitted except for short strings such as recognition codes necessary to ensure the functionality of a system. Transmission of audio material to the public switched telephone network and private and commercial wireless systems and networks is not permitted.[12]

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[10] Notice at ¶¶ 110-123.

[11] MSTV/NAB at 7.

[12] Modified from Notice, Appendix E, proposed § 15.3(hh). The last sentence of the definition is intended to bar wireless headsets, cordless phones, and similar devices. Notice at ¶ 112. It should not prohibit the transmission over telephone lines of program material that originated with a wireless microphone.

MSTV/NAB also worries that the above miscellany of wireless devices, being commonly used within homes, are frequently in the same room as a TV.[13] Again, a narrow definition of WADs would avoid this problem. In any event, a family that might experience TV interference from their own wireless device should have the right to choose between using the device and watching TV.

MSTV/NAB next objects that that WADs will be inexpensive, of inferior quality, vulnerable to breakage, prone to damage due to improper use, and less likely to comply with the Commission's technical limits.[14] Sennheiser sees see no factual basis for this concern. Many FCC-regulated products are subject to intense price competition, but we are not aware that any systematic failure of compliance has resulted. Most of the technical non-compliance offenses noted in public releases are plausibly manufacturers' errors. A few may be due to malfeasance. But none, to our knowledge, can be charged to deterioration of low-priced equipment. The Commission has adequate authority to investigate, if needed.[15]

Finally, MSTV/NAB asserts that the proposed Part 15 power limit and out-of-band emissions limits are too high to prevent interference to TV reception.[16] This fails to square with the plain fact that wireless microphones – many at powers much higher than are proposed for Part 15 – have operated in the TV bands for decades without any reported incidents of harmful interference. If anything, the potential for harmful interference to TV reception should be lower following the 2009 transition to digital TV.

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[13] MSTV/NAB at 8.

[14] MSTV/NAB at 10.

[15] 47 C.F.R. §§ 2.945 (post-grant sampling), 2.946 (penalties for failure to provide requested test samples).

[16] MSTV/NAB at 12-16.

2. Putting TVBDs and wireless microphones under the same rules would make no sense.

Dell/Microsoft and Motorola want the Commission to regulate wireless microphones under TVBD rules.[17] PISC apparently seeks the opposite: regulation of TVBDs under wireless microphone rules.[18] Dell/Microsoft and Spectrum Bridge agree with PISC to the extent of seeking to drop the requirement that TVBDs be able to sense wireless microphones.[19]

These requests are misguided. Wireless microphones and TVBDs use different technologies and serve different purposes. There is no reason to regulate them identically. In particular, TVBD rules are inappropriate and unworkable for wireless microphones. These rules not only presuppose the use of digital signals, but also sometimes require interruptions, which wireless microphones cannot tolerate. Conversely, operating highly mobile TVBSs under wireless microphone rules – even to the extent of dropping the sensing requirement – would threaten harmful interference both to broadcasting and to licensed wireless microphones.

3. The Commission must ensure that Part 15 wireless microphones have adequate spectrum.

Shure has shown that the Commission's proposed plan allows for no protected spectrum whatsoever, in some markets, for wireless microphones not registered in the TVBD database, even where channels 14-20 are not used for private land mobile services.[20]

Other parties to the proceeding present conflicting and, in some cases, unrealistic views of wireless microphones' reasonable spectrum needs.

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[17] Dell/Microsoft at 8-9; and Motorola 4-5.

[18] PISC at 7-9.

[19] Dell/Microsoft at 7-8; Spectrum Bridge at 4. The last point is not before the Commission, having been expressly excluded from the proceeding. Notice at ¶ 108.

[20] Shure at 9-11.

PISC argues that Part 15 WADs will have adequate spectrum in channels 14-20 or, in markets where channels 14-20 are used for private land mobile service, in the set-aside channels on either side of channel 37.[21] But public safety interests have asked the Commission to completely ban WADs from channels 14-20 nationwide.[22] CTIA seeks to restrict WADs and newly eligible Part 74 licensees to the "lower portion" of the TV bands,[23] while Motorola would put expanded Part 74 eligibility in the upper portion, at channels 38-51.[24] Motorola also favors making the above-and-below-37 set-asides available for wireless microphones generally in every market, while also using the first adjacent VHF channels inside a station's protected service contour for WADs.[25] Elsewhere, however, Motorola asks the Commission to keep WADs below channel 37.[26]

Both CTIA and Motorola want wireless microphones limited to the lower TV spectrum channels to facilitate a hoped-for handover of the upper channels to wireless services.[27] At present, however, the prospect of such a transfer is far too speculative and controversial to justify hobbling an important technology.

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21 PISC at 5-6.

22 Sennheiser addresses this issue in separately filed Supplemental Reply Comments.

23 CTIA at 5-6.

24 Motorola at 5.

25 Motorola at 2-4.

26 Motorola at 3 n.6

27 CTIA at 5-6; Motorola at 3 n.6.

Sennheiser reiterates the spectrum plan we put forward earlier.[28] Licensed wireless microphones should be able to operate on any open channel, as they do now. Vacant UHF channels 38-51 would be reserved for TVBDs, while vacant channels at 36 and below, where available, would be reserved for WADs. Both types of unlicensed devices will function more reliably if each has to contend only with broadcast TV, Part 74 microphones, and other units of its own kind.

C. REQUESTED CHANGES TO WIRELESS MICROPHONE TECHNOLOGY ARE NOT PRESENTLY FEASIBLE.

PISC asks for what it calls a "long-overdue, widespread implementation of digital technology in wireless microphone design and manufacturing."[29]

PISC appears to share the widespread misunderstanding that digital technology itself increases spectrum efficiency. The truth is more complicated. A designer can trade off among audio fidelity, range, reliability, battery life, latency, and spectrum efficiency. In principle any of these can be improved, but only at the expense of one or more of the others.

The more dramatic gains in efficiency from digital technology – ten-fold in wireless phones, for example, and four-fold in digital TV – result mainly from data compression. The algorithms that accomplish compression "look ahead" to exploit regularities in the content. But the look-ahead necessarily introduces delay in transmitting the signal. More compression yields greater spectrum efficiency, but increases the delay (and also degrades audio fidelity). Wireless microphones cannot tolerate a delay of more than a few thousandths of a second without

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[28] Comments of Sennheiser in WT Docket Nos. 08-166, 08-167 at 13-14 (filed Oct. 3, 2008).

[29] PISC at 5; *see also* Dell/Microsoft at 2 (seeking new rules to promote more efficient wireless microphone technologies).

throwing off the performer and distracting the audience. This limits the efficiency gains available from compression, and hence from digitization. To be sure, some day there may come a technical development that allows major improvements in efficiency without excessive latency, and at reasonable cost. But that day is not yet here.

PISC calls for wireless microphones to move to other bands, but suggests only Part 90 frequencies.[30] These have inadequate bandwidth for professional sound quality. Any other alternative bands would need both suitable propagation characteristics and adequate available bandwidth. Sennheiser is not aware of any in the U.S. jurisdiction that can do the job.

CONCLUSION

The Commission should proceed with its proposals to broaden the eligibility for Part 74 wireless microphones, and to authorize Wireless Audio Devices under Part 15.

Respectfully submitted.

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[30] PISC at 5; *see* also Notice at ¶¶ 151-52 (seeking comment on Part 90 options).

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