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Federal Communications Commission  
Office of the Secretary

Before the  
**Federal Communications Commission**  
Washington DC 20554

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

**COMMENTS OF  
SENNHEISER ELECTRONIC CORPORATION**

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**COMMENTS OF  
SENNHEISER ELECTRONIC CORPORATION**

Sennheiser Electronic Corporation (“Sennheiser”) files these comments in response to the Further Notice of Proposed Rulemaking in the above-captioned proceeding.<sup>1</sup>

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.

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<sup>1</sup> *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. SUMMARY

Wireless microphones in the TV bands are uniquely capable of providing high audio quality and reliability, good range and wall penetration, and long battery life. They are indispensable to the high production standards of U.S. news and entertainment content, one of the country's most important exports.

Eligibility for a license to use wireless microphones is currently limited to broadcasters, TV and movie production houses, and a few others. But other facilities, including theaters, houses of worship, and concert venues, use these microphones without a license. They do so because no other technology can meet their needs.

The Commission should adopt its proposal to expand eligibility to include certain venues and events that need the interference protection and power of licensed microphones. Sennheiser proposes that eligibility be extended to those facilities required to have permanently installed assistive listening systems under the Americans with Disabilities Act (ADA), except that motion picture houses would not qualify for licensing, while houses of worship would. The ADA criteria make a good starting point because they identify “assembly areas where audible communications are integral to the use of the space,”<sup>2</sup> and are well understood by facilities operators; moreover, wireless microphones are often used as the input for assistive listening systems. We also propose eligibility for Federal, state, and local governmental events, and for large outdoor concerts and other events having a capacity of 1,000 or more spectators. Eligibility should not be limited to situations requiring a certain number of microphones.

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<sup>2</sup> 28 C.F.R. Part 36 Appendix A § 4.1.3(19)(b).

The Commission should not make the manufacturer or vendor responsible for the end user's compliance with eligibility requirements. The manufacturer has no control over ultimate use. The suggested point-of-sale mechanisms would be burdensome to law-abiding customers, yet easily evaded by the dishonest. Nor should the Commission impose technical requirements to improve spectrum efficiency. The market will solve that problem on its own, if congestion makes a solution necessary.

Finally, Sennheiser strongly endorses the Commission's proposal to allow unlicensed operation at reduced power. This option will help to meet demands for high-quality sound by parties that remain ineligible for a license, and hence should cut down on the unlawful use of higher-powered microphones. Sennheiser comments below on some of the specific proposed rules for unlicensed operation.

## **B. INTRODUCTION**

TV-band wireless microphones are ubiquitous in all aspects of the entertainment business, in news reporting, in sports, and in U.S. civic and religious life.

Wireless microphones are essential to the production of virtually all non-studio broadcast events, and virtually all studio-produced programs as well. These include professional and collegiate team sports, from local college broadcasts up to the Superbowl, the World Series, the Final Four, and the Stanley Cup; the Democratic and Republican political conventions; the Oscar, Emmy, and Grammy shows; events such as the Olympics, NASCAR races, the Kentucky Derby, and major golf and tennis tournaments; and news reporting from the scene. These broadcasts routinely attract millions of viewers.

Motion-picture production, from Hollywood blockbusters with nine-digit budgets down to student work at the local community college, relies heavily on wireless microphones for clear,

accurate audio. Live events like outdoor concerts and Broadway productions need wireless microphones to reach the back row. Speakers in large auditoriums, lecture halls, and houses of worship find them indispensable.

The U.S. public has come to expect the very highest standards of production quality in all forms of television, radio, film, and live entertainment. Driven by these expectations, U.S. news and entertainment content is globally acknowledged as the best in the world. The widespread popularity of these products has made entertainment content one of the nation's leading exports. Wireless microphones are one of the production tools that fuel this success.

Users of wireless microphones have no adequate substitute for UHF TV frequencies. Unlicensed products are available in the 49 MHz, 902-928 MHz, and 2.4 GHz bands, but these are generally unsuited to professional applications. Many are little more than toys. The low available power and high interference levels makes them unreliable, while the narrow bandwidth of most units impairs audio quality. One manufacturer offers an unlicensed microphone using ultra-wideband technology, which in principle should be capable of high audio quality, but in practice is necessarily limited in range and wall penetration.<sup>3</sup>

Given the need for wireless microphones and the lack of alternative frequencies, it is in the public interest for the Commission to expand their legitimate use to some presently ineligible parties, and to allow unlicensed use at lower power by the public at large.

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<sup>3</sup> Commission rules tightly restrict the power of ultra-wideband devices, and require them to operate at frequencies high enough that building materials cause significant attenuation. *See* 47 C.F.R. § 15.517.

**C. THE COMMISSION SHOULD EXPAND ELIGIBILITY FOR LICENSED OPERATION.**

Sennheiser favors a moderate, controlled expansion of eligibility for licensing. In general, operation should be limited to venues requiring higher power and/or more reliable operation than are available under Part 15.

Eligibility for licensing should *not* depend on the number of wireless microphones needed.<sup>4</sup> Sennheiser strongly disagrees that events using “only a few wireless microphones may not require the assurance of interference protection afforded by a license.”<sup>5</sup> To the contrary, even facilities using only one or two microphones may justifiably need the higher power and interference protection that licensing provides. A one-man show on Broadway, a comedian at an outdoor amphitheater, a Nobel laureate lecturing in a big university auditorium – each of these uses should qualify for licensing despite the need for only a single microphone.

***1. Proposed eligibles***

Sennheiser proposes this list of additional eligibles:

- Assembly areas where audible communications are integral to the use of the space, and which have (a) fixed seating *and* (b) either an audio amplification system or an occupancy of 50 or more. (See the explanation below.)
- Federal, state, and local governmental events.
- Outdoor public or trade events with a capacity of 1,000 or more spectators (*e.g.*, air shows, over-water sporting events, concerts such as “Paul Simon in Central Park”).

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<sup>4</sup> See Notice at ¶ 131 (“Should we base eligibility on a minimum number of wireless microphones that the entities use on a regular basis, and if so, what should that number be?”)

<sup>5</sup> Notice at ¶ 129. See also Notice at ¶ 130 (assertion that religious facilities services using only a few wireless microphones may have greater flexibility to select TV channels free of interference).

- Rental companies that supply equipment for eligible users. (The license to a rental company would be valid only for otherwise qualifying venues.)

*Explanation:* The first bullet above tracks regulations under the Americans with Disabilities Act (“ADA”) identifying facilities that are required to have permanently installed assistive listening systems.<sup>6</sup> Sennheiser submits that this list provides a good approximation of facilities in which audio quality and reliability are important enough to warrant licensing. The list is also well understood by facilities operators through experience under the ADA. Moreover, wireless microphones are often used as input devices to assistive listening systems, so that licensing wireless microphones where these systems are required will help to further the purposes of the ADA. We propose to depart from the ADA list in two respects: by dropping motion picture houses, and adding houses of worship.<sup>7</sup> Examples of qualifying facilities would include theaters, concert halls, stadiums, auditoriums, convention centers, lecture halls, houses of worship, and other places of exhibition, entertainment, or public gathering.<sup>8</sup>

Note that a facility must meet three distinct requirements to qualify under the first bullet: it must constitute an “assembly area[] where audible communications are integral to the use of the space,” have fixed seating, and have either a sound system or a capacity of fifty or more.<sup>9</sup>

The second, third, and fourth bullets above are self-explanatory.

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<sup>6</sup> 28 C.F.R. Part 36 Appendix A § 4.1.3(19)(b).

<sup>7</sup> Houses of worship are exempt from ADA requirements under 28 C.F.R. § 36.102(e), but should have access to licensed wireless microphones if they otherwise qualify.

<sup>8</sup> This list of examples is adapted from the ADA regulations at 28 C.F.R. § 36.104 (definition of “place of public accommodation” ¶¶ (3), (4)), with the two modifications noted in the text.

<sup>9</sup> The ADA criterion of a sound system is self-enforcing here, as a facility without one would have no need for a wireless microphone.

## 2. *License term*

License terms for wireless microphones now run concurrently with those of the parent broadcast station, and if there is none, concurrently with the terms for broadcast stations in the area.<sup>10</sup> The Commission asks whether the same rule should apply to new categories of eligibles.<sup>11</sup>

Sennheiser agrees with the Commission's suggestion that the license term for Class B (newly eligible) licensees be ten years.<sup>12</sup> As the Commission notes, this is the term for most categories of wireless licenses.

### **D. THE COMMISSION SHOULD NOT REQUIRE VENDORS TO ENFORCE ELIGIBILITY REQUIREMENTS FOR LICENSED WIRELESS MICROPHONES.**

The Commission asks whether it should limit the marketing of licensed wireless microphones to eligible parties, and whether violations should be grounds for revocation of the equipment certification.<sup>13</sup> The Commission adds several suggestions for furthering compliance and enforcement, including requirements for:

- labeling on the equipment or on the packaging;
- licensing information in the instruction manual;
- written confirmation from the buyer to the vendor that the buyer is eligible for licensing;
- records of customers and their eligibility to be retained by manufacturers;

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<sup>10</sup> 47 C.F.R. § 74.15(b).

<sup>11</sup> Notice at ¶ 138.

<sup>12</sup> *Id.*

<sup>13</sup> Notice at ¶ 142.

- buyers presenting a “facility identification number” or other proof of licensing to the vendor; and
- vendors confirming eligibility by looking up the customer in a Commission-maintained database.<sup>14</sup>

Sennheiser itself would be minimally affected by these proposals. 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.<sup>15</sup>

Sennheiser would not oppose a brief label on the packaging of wireless microphones that operate at over 50 mW, *e.g.*, “Unlawful to operate without FCC license.” It also does not oppose placing an appropriate statement in the instruction manual.

Sennheiser does, however, oppose a required label on the device itself. Wireless microphones are often plainly visible to audiences – in TV close-ups, for example. Manufacturers compete on the “look” of a microphone along with its technical qualities. A required label would deface the visual appearance and be distracting to audiences.

Sennheiser also vigorously opposes any proposal that would shift the burden of compliance with licensing rules from the end user to the seller. We know of only one provision in the Commission’s rules that limits marketing to eligible end users. It applies solely to a narrow category of *unlicensed* ultra-wideband imaging and surveillance devices whose sale is

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<sup>14</sup> Notice at ¶¶ 142-144.

<sup>15</sup> [www.sennheiserusa.com](http://www.sennheiserusa.com)

limited to state and local police and fire departments, etc.<sup>16</sup> Such a provision arguably makes some sense in the unlicensed context, where the Commission has no other means of control over who uses the equipment. But nothing in the rest of the rules, among licensing requirements for dozens of services, holds the vendor responsible for a sale to a non-licensed or ineligible party.

Worse, the Commission proposes to punish a sale to an ineligible party by revoking the manufacturer's or importer's certification.<sup>17</sup> This targets the innocent. A manufacturer like Sennheiser has no workable way of controlling sales by others down the distribution chain. Revocation is the sanction in Section 15.507, on ultra-wideband imaging and surveillance devices; but that is a small, specialized market in which the manufacturer typically sells directly to the end user. Here, in the much more complex market for wireless microphones, it would be wrong to penalize the manufacturer for the errors of an end user with whom the manufacturer has never done business.

The suggested compliance provisions are also impracticable. Requiring the customer to sign a certification, or having the retailer check customer ID or a database, would be overly burdensome for the law-abiding customer, would run up costs for the retailer, and would undo much of the economy of Internet commerce. These measures would also be easy for an unscrupulous customer to evade. One can imagine facility identification numbers and similar credentials circulating on the Internet, along with information for impersonating individuals in the database. While burdening sellers, these compliance measures would do little to stop an ineligible but determined end user.

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<sup>16</sup> 47 C.F.R. § 15.507.

<sup>17</sup> Notice at ¶ 142.

Further, the suggested rules ignore the realities of resale. A glance at eBay, for example, shows hundreds of wireless microphones for sale, both used and new. It is unrealistic to expect that a one-time casual seller, or even a frequent seller operating out of a home office or dorm room, will undertake required compliance checks.

It is a violation of the Communications Act and the Commission's Rules (with limited exceptions) to operate a radio transmitter without a license.<sup>18</sup> Sennheiser would expect routine enforcement against non-eligibles who apply for a Part 74 license, and against anyone uses a Part 74 wireless microphone without a valid license.

The impetus for controls on marketing doubtless stems from past reports of widespread use by ineligible persons. That should be less of a problem going forward. In the past, those who needed high-quality wireless microphones, but who were not eligible for licensing, had few good options. Wireless microphones outside the TV bands generally offer inferior sound quality, low range, and poor reliability. Accordingly, some ineligible users risked Commission sanctions to obtain the performance they needed. For the future, however, assuming the Commission expands eligibility, there will be fewer ineligible users, and the Part 15 option will offer even those users better-quality performance than was formerly available. It is reasonable to expect a lower incidence of violations in the future.

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<sup>18</sup> 47 U.S.C. § 301 (license required to operate any apparatus for transmission by radio); 47 C.F.R. § 1.80 (penalty for operation without instrument of authorization).

**E. THE COMMISSION SHOULD NOT IMPOSE ADDITIONAL TECHNICAL REQUIREMENTS ON WIRELESS MICROPHONES.**

The Notice asks whether the Commission should require wireless microphones to migrate to other technologies, such as modulation with a digital signal, in order to improve spectrum efficiency and resistance to interference.<sup>19</sup>

At this stage of technical evolution, Commission mandates for changes in design to improve spectrum usage are unnecessary, and may be counterproductive. The criteria imposed on professional wireless microphones are demanding: extremely high audio quality, inaudible background noise, adequate range, effective penetration of bodies and building materials, long battery life, no drop-outs, and low latency. It is not presently possible for a wireless microphone using digital signals to adequately achieve all of these characteristics at reasonable cost.

In other contexts, digital signals improve spectrum efficiency largely through compression: it is possible to compress digital information by a significant factor, transmit that smaller amount of information, and then recover a signal very much like the original. Compression allows digital TV and digital cell phones, for example, respectively to transmit about four and ten times as much content in the same spectrum as their analog counterparts. But the compression process significantly delays the communication. The more compression, the more delay; the algorithm works by “looking ahead” to exploit regularities in the content. The delay is not usually noticeable when watching TV, and is only a minor irritant in cell phones. But a wireless microphone cannot tolerate a delay of more than a few thousandths of a second without throwing off the performer and distracting the audience. This greatly limits the feasible compression.

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<sup>19</sup> Notice at ¶¶ 145-49.

As more wireless microphones are deployed in a fixed amount of spectrum, not only will manufacturers will come under pressure to improve spectrum efficiency, but the market will evolve to cover the costs. The Commission should let that process happen on its own. In the meantime, the Commission can always revisit the issue if congestion becomes a serious problem.

**F. SENNHEISER SUPPORTS UNLICENSED OPERATION FOR USERS WHO REMAIN INELIGIBLE UNDER PART 74.**

Sennheiser strongly endorses the Commission's proposal to allow unlicensed operation under Part 15 by users who do not qualify under Part 74.

Responding to various Commission proposals, Sennheiser supports:

- permitted use of either analog or digital modulation;
- prohibition of transmission to the public switched telephone network and private and commercial wireless systems and networks (i.e., no wireless headsets or cordless phones);
- prohibition of video transmission;
- ban on after-market RF transmitter amplifiers;<sup>20</sup> and
- proposed technical rules on co-channel separation, 50 mW power limit, channelization, frequency stability, and out-of-band emissions.<sup>21</sup>

We support two other elements, with minor modifications. The Commission proposes to prohibit data transmission, except for short recognition codes.<sup>22</sup> The rules should also permit a wireless microphone to report its battery status to the receiver, for the benefit of personnel

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<sup>20</sup> This applies only to Part 15. The sale of properly certified RF amplifiers should be allowed under Part 74.

<sup>21</sup> Notice at ¶¶ 112-113, 115-118.

<sup>22</sup> Notice at ¶ 112. Sennheiser understands recognition codes to include, among other information, data on the transmitter type and microphone capsule.

stationed there.<sup>23</sup> The Commission further proposes a limitation to one-way operation.<sup>24</sup>

Sennheiser has received requests for a product that combines the radio functions of a wireless microphone and an in-ear monitor in one unit. This would require simultaneous transmission of program material in both directions. Sennheiser supports a one-way limitation so long as an exception is available for this category of product.

Sennheiser opposes separate certification for unlicensed wireless microphones.<sup>25</sup> The large majority of wireless microphones operate at 50 mW or less and, depending on the eventual technical rules, may qualify under both Part 74 and Part 15. Separate certification would require maintaining separate inventories of the same product, differing only in FCC ID number, for shipment to different categories of customers. This is an added burden on the manufacturer and everyone else in the distribution chain, with no concomitant benefit. A device that qualifies under both Part 75 and Part 15 should be certified under the same FCC ID for marketing under both rule parts.

Sennheiser strongly agrees with the Commission's assessment that the rules for TVBDs are inappropriate for wireless microphones.<sup>26</sup> TVBDs are variously required to be capable of geolocation, database look-up, and spectrum sensing, and their operation is subject to interruption if certain conditions are not met.<sup>27</sup> These constraints are incompatible with a device

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<sup>23</sup> A prohibition on data transmission should not bar an encrypted digital audio signal.

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

<sup>25</sup> Notice at ¶ 121.

<sup>26</sup> Notice at ¶ 120.

<sup>27</sup> 47 C.F.R. § 15.711.

that must operate continuously. The TVBD technical rules also presuppose the use of digital signals, which for the time being is impractical, for the reasons as discussed above.<sup>28</sup>

*Transition period.* The Commission asks whether it should impose a transition period to new Part 15 rules, and if so, for how long.<sup>29</sup> The inquiry presupposes that existing Part 74 equipment that meets the 50 mW power limit could be marketed and operated under Part 15 during the transition.

Sennheiser suggests that the transition period depend on whether the Commission makes changes to the technical rules for Part 15 use (apart from imposing the 50 mW power limit):

- If the technical standards do not otherwise change, then no transition period is necessary. Existing products (power of 50 mW or less) will comply with the new rules. They can have Part 15 added to the certification immediately, and be marketed indefinitely.
- If the technical standards do change, then manufacturers should be able to have Part 15 certification added to existing products (power of 50 mW or less) for two years following the effective date of the rules. Manufacturers and distributors should be able to market those products until four years after the effective date.

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<sup>28</sup> The Notice (at ¶ 120) suggests Part 15 wireless microphones will have an advantage over adjacent-channel TVBDSs due to their slightly higher power (50 vs. 40 mW). In fact, however, TVBDSs are far more likely to disrupt wireless microphones than vice versa. Analog-modulated wireless microphones are inherently more susceptible to interference than digitally modulated TVBDSs, and wireless microphones must meet far higher performance criteria for drop-outs and latency.

<sup>29</sup> Notice at ¶ 122.

## **CONCLUSION**

Sennheiser welcomes the Commission's proposals to expand Part 74 eligibility and allow Part 15 operation, as discussed above.

Respectfully submitted.

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March 1, 2010

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