

Before the
Federal Communications Commission
Washington DC 20554

In the Matter of)	
)	
Promoting Spectrum Access for Wireless Microphone Operations)	Docket No. 14-166
)	
Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and)	Docket No. 14-165
)	
Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap)	
)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions)	Docket No. 12-268
)	

**CONSOLIDATED PETITION FOR RECONSIDERATION OF
SENNHEISER ELECTRONIC CORPORATION**

Pursuant to Section 1.429(a) of the Commission’s rules, Sennheiser Electronic Corporation (“Sennheiser”) seeks reconsideration of four aspects of two Report and Orders related to the future of wireless microphone use.¹

A. SUMMARY

The two proceedings at issue here represent the culmination of several years of effort to reconstruct the 600 MHz spectrum landscape in order to make way for new entrants pursuant to the Congressionally-mandated incentive auction. The wireless microphone community has borne

¹ *Promoting Spectrum Access for Wireless Microphone Operations*, Report and Order, 30 FCC Rcd 8739 (2015) (*Mic Opportunity R&O*) and *Amendment of Part 15 of the Commission’s Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 60 MHz Guard Bands and Duplex Gap, and Channel 37, and Amendment of Part 74 of the Commission’s Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 60 MHz Duplex Gap*, Report and Order, 30 FCC Rcd 9551 (2015) (*Part 15 R&O*).

a disproportionate brunt of those maneuverings, losing access to a large portion of 600 MHz spectrum. But, at least for licensed users, some but not all of this loss is addressed by gaining access to spectrum in other frequency bands.

The Commission has issued a myriad of rules for this new regulatory regime.² Sennheiser seeks reconsideration of just a few: 1) the limitation on LPAS access to 1.4 GHz spectrum to no more than 30 MHz of spectrum at a given time; 2) requiring spurious emissions limits beyond the ETSI mask; and 3) the frequencies in the 169-172 MHz band. Additionally, Sennheiser seeks clarification and/or reconsideration regarding the applicability of Section 15.201 to unlicensed wireless microphones. The Commission should reconsider (or clarify) these technical rules to ensure spectrum access for wireless microphone users.

B. BACKGROUND

Sennheiser is part of Sennheiser Electronic GmbH & Co. KG, headquartered in Germany, which is a global leader in advanced microphone technology, RF-wireless and infrared sound transmission, headphone transducer technology, and active noise cancellation. Sennheiser Electronic Corporation is the main U.S. sales and marketing office, located in Old Lyme, Connecticut. Sennheiser also has a research center in San Francisco, California, and a manufacturing plant in Albuquerque, New Mexico that produces the majority of Sennheiser wireless microphones sold in North America, South America, Canada, and Asia.

The Commission has recognized that wireless microphones are vital to a large component of the U.S. economy.³ Wireless microphones are ubiquitous in all aspects of the entertainment business, in news reporting, in sports, and in U.S. commercial, civic, and religious life. They are essential to the production of virtually all non-studio broadcast events, and to nearly all studio-

² *Id.*

³ *See e.g. Mic Opportunity R&O* at ¶ 1.

produced programs as well. These include college and professional team sports, political conventions, election coverage, awards shows, events such as the Olympics, NASCAR races, and the Kentucky Derby, and on-the-scene news reporting of all kinds. These broadcasts routinely attract millions of viewers; the entities that put on these productions are referred to as “power users” by Sennheiser.

Sennheiser has participated extensively in all of the above-captioned proceedings, fighting for continued access to sufficient spectrum resources for all wireless microphone users. While we appreciate the Commission’s efforts to work out a viable future for wireless microphone use in the United States, we believe that several errors must be corrected.

C. THE 30 MHZ SPECTRUM ACCESS LIMIT FOR 1.4 GHZ HAS NO BASIS IN THE RECORD OR OTHERWISE AND SHOULD BE ELIMINATED.

In the Notice of Proposed Rulemaking initiating the wireless microphone opportunities proceeding, the Commission proposed to “mak[e] the 1.4 GHz band spectrum available for use by wireless microphones on a secondary licensed basis.”⁴ That access was to be subject to a number of proposed safeguards with respect to which the Commission expressly sought comment.⁵ For example, LPAS operations in the 1.4 GHz band would be limited to important events at specific fixed locations, *i.e.* where there is a need to use large numbers (generally, 100 or more) of microphones. Prior coordination with the Aerospace and Flight Test Radio Coordinating Council (“AFTRCC”), the test flight frequency coordinator, would also be required, as would “authentication and location verification” of LPAS equipment operating in 1.4 GHz.⁶ In the Report and Order adopting the rules, all of these conditions were included. But

⁴ *Promoting Spectrum Access for Wireless Microphone Operations*, Notice of Proposed Rulemaking, 29 FCC Rcd 12343 at ¶177 (2014) (*Mic Opportunity NPRM*).

⁵ *Id.*

⁶ *Mic Opportunity R&O* at ¶¶ 116-118.

in the Report and Order, the Commission also included another condition that had not been alluded to at all in the NPRM: prohibiting LPAS licensees from obtaining access to more than 30 MHz of spectrum in any particular geographic area.⁷ This cap, however, is impermissible, barred by the Administrative Procedure Act (“APA”) because it is not a “logical outgrowth” of the proposal as announced by the Commission.

It is well established that:

[The APA's] notice requirements are designed (1) to ensure that agency regulations are tested via exposure to diverse public comment, (2) to ensure fairness to affected parties, and (3) to give affected parties an opportunity to develop evidence in the record to support their objections to the rule and thereby enhance the quality of judicial review.⁸

An agency’s proposed rule and its final rule may differ only insofar as the latter is a “logical outgrowth” of the former.⁹ And in order to be a “logical outgrowth,” an adopted provision must be one that interested parties should have anticipated so that they could submit comments with respect thereto.¹⁰

Here, the NPRM gave not the slightest hint that LPAS access to the 1.4 GHz band would be limited to a set amount of spectrum, let alone that it would be limited to a mere one-third of that band. To the contrary, the Commission proposed to “mak[e] the 1.4 GHz band spectrum available” for wireless microphones.¹¹ The Report and Order cites no prior reference, in the NPRM or in any comments, to any limitation on LPAS access. There is no way that Sennheiser, or any other party, could have foreseen from the NPRM or from any other filings in the record of

⁷ *Id.* at ¶ 118.

⁸ *International Union, United Mine Workers of America v. Mine Safety & Health Administration*, 407 F.3d 1250, 1259 (D.C. Cir. 2005) (citing *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 547 (D.C. Cir. 1983)).

⁹ *See Environmental Integrity Project v. EPA*, 425 F.3d 992, 996-997 (D.C. Cir. 2005).

¹⁰ *See Shell Oil Co. v. EPA*, 950 F.2d 741, 750–51 (D.C.Cir.1991); *Northeast Maryland Waste Disposal Auth. v. EPA*, 358 F.3d 936, 952 (D.C. Cir. 2004).

¹¹ *Mic Opportunity NPRM* at ¶ 177.

the proceeding the possibility that “making the band available” might mean “making no more than one-third of the band available.”

To the best of Sennheiser’s knowledge, no commenter suggested such a limitation – which confirms the lack of notice in the NPRM. Sennheiser is aware that CTIA filed one *ex parte* letter suggesting that wireless microphone access “in new spectrum bands” should be capped at 12 MHz.¹² The mere fact that a single party happened to advance an *ex parte* “suggestion” does not transform the 30 MHz cap into a logical outgrowth here: where “ambiguous comments and weak signals from the agency gave petitioners no ... opportunity to anticipate and criticize the rules or to offer alternatives.”¹³ As was unquestionably the case here, the rule exceeds the limits of a logical outgrowth. It is, after all, “the business of the [Agency], and not the public, to foresee that possibility and to address it in its proposed regulations.”¹⁴ This is especially true in this instance, where CTIA’s purpose, to avoid a “significant increase in the amount of spectrum” for wireless microphones (in favor of its own future access to the band), was entirely different than the FCC’s stated reasons – facilitating coordination and promoting development of spectrally efficient technologies.

¹² Letter from Scott K. Bergmann, Vice President, Regulatory Affairs, CTIA to Marlene H. Dortch, Secretary, Federal Communications Commission, Docket Nos. 14-165, 14-166, 12-268 (filed July 10, 2015).

¹³ See, e.g., *Shell Oil Co.*, 950 F.2d 741, 751 (D.C. Cir. 1992).

¹⁴ *Id.* See also *NRDC v. Thomas*, 838 F.2d 1224 (D.C. Cir. 1988), *cert. denied sub nom, Ala. Power Co. v. Thomas*, 488 U.S. 888 (1988). In *NRDC*, a proposal not initially made by the agency happened to be advanced by a commenter. On review the court affirmed adoption of a rule similar to the commenter’s suggestion, but only because the agency had issued a public notice concerning the suggestion and invited comment on it prior to adoption of the rule – and even then, the court remarked that those circumstances “stretche[d] the concept of ‘logical outgrowth’ to its limits.” *Id.*, 838 F.2d at 1243. Here, the Commission issued no such notice and invitation to potential commenters.

Because the Commission failed to provide any notice, much less adequate notice, of the possibility that a 30 MHz cap on wireless microphone access to the 1.4 GHz band might be considered, that aspect of the rules must be reconsidered and deleted from the rules.

Moreover, the 30 MHz limitation is unduly restrictive and not technically necessary. The coordination procedures put in place will allow AFTRCC to review each proposed use and determine – prior to operation – whether that proposed use is appropriate. Wireless microphone operations on 1.4 GHz should not be restrained unnecessarily, especially given that the purpose behind the new regime is to provide for much needed spectrum for wireless microphone “power users” who coordinate large-scale events. The Commission has noted that these licensees use at least 100 microphones per event, so it is perplexing why the Commission would chose to limit access to the necessary amount of spectrum. While the Commission states that LPAS licensees could apply for Special Temporary Authority (“STA”) to obtain more than 30 MHz of spectrum, that is a wholly unnecessary burden that serves no purpose.

For these reasons, the Commission should delete its rule limiting LPAS access to 1.4 GHz to no more than 30 MHz of spectrum.

D. THE COMMISSION ERRED IN IMPOSING OUT-OF-BAND EMISSION REQUIREMENTS OUTSIDE THE ETSI MASK.

Sennheiser also seeks reconsideration of the Commission’s decision to require extended out-of-band emission limits to the ETSI mask. Sennheiser supported adoption of the ETSI mask for wireless microphones because it is the industry standard and is sensible from a design perspective, as it allows for maximum use of channels. As Sennheiser noted, the ETSI emission mask attenuates a signal to -90 dB at 1 MHz from the center operating frequency.¹⁵ However, the FCC determined to impose the -90 dBc spurious emissions limit to all frequencies above and

¹⁵ *Sennheiser Reply Comments* at 7, Docket 14-165 (filed Feb. 25, 2015).

below the mask.¹⁶ Again, this is violation of the APA because the NPRMs suggested only that the ETSI mask (and Section 15.209 in the instance of unlicensed use) would apply, not that emissions limits would be extended beyond that.¹⁷

The rule exceeds the limits of a logical outgrowth because, as a result of the adopted rule, spurious emissions must be below -90 dBm at all frequencies throughout the radio spectrum. Further, transmit mask measurements and the spurious emission measurements are two different types of measurements, and the ETSI standard (unlike the FCC's new rule) differentiates between these.¹⁸ The adopted rule, therefore, goes far beyond what was proposed and far beyond what is needed to protect authorized services.¹⁹ The new rule also is an impractical technical specification for manufactures to obtain and meet because, given the state of test equipment, it will be extremely difficult to measure and verify compliance for very low power transmitters. And it serves no useful purpose.²⁰ For consistency, simplicity, efficient certification for global markets, and compliance with the APA, the FCC should rescind this rule and instead match the ETSI standards exactly.

¹⁶ *Mic Opportunity R&O* at ¶ 32, ¶ 94 and ¶ 132 and n.203 and n.311; *Part 15 R&O* at ¶ 101 (“Outside of the frequency range where the ETSI masks are defined (one megahertz above and below the wireless microphone carrier frequency), we will require that emissions comply with same limit as the edge of the ETSI masks, specifically, 90 dB below the level of the unmodulated carrier.”).

¹⁷ *Mic Opportunity NPRM* at ¶¶ 87-92; *Part 15 NPRM* at ¶ 154.

¹⁸ As a practical matter, for operations in the UHF band, for example, under the ETSI standard (available at www.etsi.org) spurious emissions would need to be at -54 dBm but under the FCC limit an additional 36 dB of attenuation would be required for a 1 mW transmitter.

¹⁹ It is more stringent at low transmitter output power, where the potential for interference is already minimal.

²⁰ For example, the Commission separately determined that a 1 MHz buffer between wireless microphones and 600 MHz licensees would be sufficient interference protection, given the ETSI specification. *Part 15 R&O* at ¶ 140.

E. THE SELECTION OF 200 KHZ WIDEBAND FREQUENCIES IN 169-172 MHZ IMPEDES INTERMODULATION FREE WIRELESS MICROPHONE OPERATIONS.

In modifying the rules for wireless microphone operation in the 169-172 MHz band, the Commission identified four center frequencies for wider (200 kHz) emission bandwidth: 169.475 MHz, 170.275 MHz, 171.075 MHz, and 171.875 MHz.²¹ While this rule change does allow for high fidelity wireless microphone operations, these specific frequencies are not coordinated to be intermodulation (IM) free, even from 3rd order IM products which pose the greatest potential to cause interference. The potential IM-3 harmonics directly coincide with the center frequencies of these four designated carriers.

Sennheiser had requested that frequency assignments in this range be changed to allow more frequencies to operate simultaneously, and supported 200 kHz bandwidth operations on center frequencies throughout the band.²² The Commission declined to allow wireless microphone operation on center frequencies throughout the band that would overlap with forest firefighting channels, and instead created four new channel centers between the existing neighboring pairs of channels.²³ Because the four neighboring pairs are not frequency coordinated, the four new wideband channel frequencies centered within the pairs will suffer from the same intermodulation limitations, constraining use of the band by wireless microphones.

Sennheiser suggests shifting some of the neighboring pairs so they are frequency coordinated yet still do not overlap with forest fighting channels or the public safety operations frequency at 170.150 MHz. Addressing these intermodulation issues would improve access to all of the frequencies within this band (narrowband and wideband) for wireless microphones. And it

²¹ *Mic Opportunity R&O* at ¶ 76.

²² *Comments of Sennheiser*, Docket 14-166, at p. 20 (filed Feb. 4, 2014).

²³ *Mic Opportunity R&O* at ¶¶ 75-76.

would allow flexible and cost effective wireless microphone designs.²⁴ One example solution would be to shift two of the Section 90.265(b) narrowband neighboring pairs, centering the new 200 kHz wideband channel in between.²⁵ Other scenarios are possible and we are ready and willing to work with the Commission further on this issue.

F. APPLICABILITY OF PART 15 RULES TO THE CERTIFICATION OF UNLICENSED WIRELESS MICROPHONES.

Sennheiser requests clarification or reconsideration of the applicability of Section 15.201 to unlicensed wireless microphones.²⁶ In 2010, the Commission waived Section 15.201 when it permitted unlicensed wireless microphones to operate under Part 15.²⁷ In the Part 15 NPRM, while the Commission noted that it would codify Part 15 rules for unlicensed microphones, it did not specifically raise the applicability of Section 15.201 or suggest that that aspect of the waiver would not apply under the new regime.²⁸ And several statements in the NPRM indicated that the Commission intended to impose rules consistent with the waiver.²⁹

Sennheiser has specific concerns with regard to the application of Section 15.201 to unlicensed wireless microphones, and in particular Sections 15.203 and 15.204, which require that no other antenna may be provided or used with Part 15 certified devices.³⁰ Part 74 does not

²⁴ Systems are often configured in multiples of four, so four intermodulation free frequencies provide practical, economic sense for wideband and narrowband designs.

²⁵ For example, 169.445 MHz to 169.545 MHz, 169.505 MHz to 169.605 MHz, and the wideband channel centered at 169.575 MHz; 170.245 MHz to 169.995 MHz, 170.305 MHz to 170.055 MHz, and the wideband channel centered at 170.025 MHz; and leaving the other narrowband channels as is.

²⁶ 47 C.F.R. § 15.201 (requiring that Part 15 intentional radiators be certified under Part 15 Subpart C).

²⁷ *Part 15 NPRM* at ¶ 94 and n.190.

²⁸ *See Part 15 NPRM* at ¶ ¶ 145-157.

²⁹ *Id.* at ¶ 151 (stating that “[c]onsistent with the current technical rules that apply under the existing Part 15 waiver” 50 mW power would be proposed, and specifically asking whether “component parts such as amplifiers” should be permitted to be attached).

³⁰ 47 C.F.R. § § 15.203 and 15.204.

does prohibit detachable antennas, and certain wireless microphone products (in particular, ear monitor systems) could not be certified under Part 15 if these rule sections apply.³¹ Given the lack of clarity in the proceeding, the difficulty in meeting these rule parts, and the absence of any issues from equipment in the field, Sennheiser requests a finding that the Section 15.201 waiver remain in force.

G. CONCLUSION

To improve wireless microphone spectrum access, and comply with the APA, the Commission should reconsider its decisions and: 1) not limit LPAS access to 1.4 GHz to no more than 30 MHz of spectrum per location; 2) not apply the -90 dBc spurious emissions limit for all frequencies above and below the ETSI mask specification; 3) designate coordinated frequencies for wireless microphones in 169-172 MHz; and 4) find that the Section 15.201 waiver remains in force.

Respectfully submitted,



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³¹ With ear monitor systems, the transmitters, which have detachable antennas, are located near the mixer, and the body-worn receiver pack feeds earphones. Because unlicensed 600 MHz users are professional users, and because using components that are not optimally matched to a system would degrade its performance, a user would swap antenna components with a product designed by the manufacturer.