Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
	)	
Promoting Spectrum Access for Wireless Microphone Operations	)	GN 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	)	ET 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	)	GN Docket No. 12-268

REPLY OF SENNHEISER ELECTRONIC CORPORATION

Sennheiser Electronic Corporation ("Sennheiser") hereby replies to the CTIA Opposition and Reply to certain Petitions for Reconsideration filed in the above captioned proceedings.[1]

[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").

DISCUSSION

CTIA opposes requests made by the wireless microphone manufacturer community asking that the Commission reconsider several new rules that impact the future of wireless microphone operations in the U.S.[2] Sennheiser demonstrates below that CTIA's points are mistaken and should not be considered by the Commission.

A. The ETSI Standard Should be Adopted in its Entirety.

CTIA opposes reconsideration of the FCC's adoption of out-of-band emissions ("OOBE") limits beyond the ETSI requirements, sought by all major wireless microphone manufacturers, on the grounds that wireless handsets will not be protected and that OOBE "should not be further relaxed."[3] This position conflates the need to control harmonics in the 600 MHz band with requiring the absence of harmonics across the entire radio spectrum. Sennheiser's concern is that the emissions requirements that have been adopted for outside of the frequency range where the ETSI masks are defined, *i.e.*, across the entire radio spectrum, are unachievable.

The ETSI standard is not "relaxed."[4] It is much more stringent than the current rules, as Shure details in its Petition for Reconsideration.[5] Indeed, if the ETSI standard were insufficient to protect wireless handsets, carriers operating in the 700 MHz band would have encountered interference problems from wireless microphones operating just under 698 MHz, which has not

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[2] Opposition and Reply of CTIA to Petitions for Reconsideration, Dockets 14-165, 14-166 and 12-268 (filed Feb. 29 2016) ("CTIA Opposition").
[3] CTIA Opposition at 2.
[4] *See* CTIA Opposition at 2-5.
[5] *See* Petition for Reconsideration of Shure, GN Docket No. 14-166, at p.7 (filed Dec. 17, 2015). *See also* Part 15 R&O at ¶ 101 (requiring "wireless microphones **to meet these tighter emission requirements**") (emphasis added).

occurred. Also, wireless microphones that comply with the ETSI standard operate in the European duplex gaps without issue.

CTIA claims that there is no technical data or information that demonstrates that the ETSI standard will protect wireless handsets from harmful interference and therefore does not meet the requirements of the Spectrum Act.[6] The ETSI standard provides for protection of wireless handsets, as the Commission concluded.[7] ETSI EN 300 422 chapter 8.4 specifies limits 1 MHz above / below the carrier for different frequency ranges. The Commission did not, however, explain why it imposed its own emissions requirement beyond the ETSI mask, rather than adopting the ETSI OOBE benchmarks.[8] CTIA, for its part, relies heavily on a report from VCOMM in asserting that this requirement is necessary,[9] but the wireless microphone industry has detailed flaws in this report,[10] and the Commission did not rely on it in determining the new emissions requirements.[11]

AFTRCC notes that, if reconsideration of OOBE is granted, it will need to consider how the revised emissions benchmark will affect its ability to coordinate wireless microphone applications for 1.4 GHz operations.[12] Sennheiser is completely confident that the ETSI standards, in their entirety, will allow for successful coordination.

CTIA is mistaken in its claim that "[t]he technical changes proposed by wireless microphone manufacturers would violate the Spectrum Act's requirement that these devices not

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[6] CTIA Opposition at 5.
[7] Part 15 R&O at ¶ 101.
[8] *Id*.
[9] CTIA Opposition at 5.
[10] Reply Comments of Sennheiser Electronic Corporation, ET Docket No. 14-165, at 14-16 (filed Feb. 25, 2015).
[11] Part 15 R&O at ¶ 101.
[12] Comments of Aerospace and Flight Test Radio Coordinating Council, Inc. on Petitions for Reconsideration, GN Docket No. 14-166, at 3 (filed Feb. 29, 2016) ("Comments of AFTRCC").

cause harmful interference to primary licensed services."[13] The Commission has defined OOBE standards for white space devices that will protect 600 MHz licensees. Adopting the ETSI OOBE measurement standard for wireless microphones would make the requirement comparable to the requirement for white space devices, with which they will be sharing the Duplex Gap and Guard Bands. This is in line with the Commission's stated intent to treat the two types of devices similarly with regard to protecting 600 MHz wireless licensees.[14]

ETSI uses absolute values for OOBE measurements outside its emission mask. This makes sense. The FCC's decision, imposing a spurious emission limit relative to the carrier, however, makes it more difficult for lower power transmitters to comply, even though such transmitters would pose a significantly lower possibility of causing interference compared with higher power transmitters. Under the rules adopted by the FCC, the higher the output power of the device, the higher the allowed spurious emissions, and the higher the probability of causing interference because the limits are defined relative to carrier power. In contrast, by using the ETSI standard, the absolute value for the limits guarantees the same protection to 600 MHz wireless licensees from all wireless microphone transmitters, regardless of power level.

The Commission's decision to require out-of-band emission requirements above and beyond the ETSI standard – a standard well-established, effective, and practical – should be reconsidered. Instead, the Commission should rely on the ETSI standard to provide the required interference protection.

[13] CTIA Opposition at 2.
[14] Part 15 R&O at ¶ 140.

B. Wireless Microphones Should Operate at 50 mW in the Duplex Gap and Guard Bands.

CTIA also challenges wireless microphone manufacturers' requests for reconsideration of the allowable power levels in the Duplex Gap and Guard Bands.[15] The 20 mW limit was adopted without any evidence that it is necessary to protect wireless handsets, and for this reason alone is ripe for reconsideration. In particular, the Commission relied upon a theory that the aggregated power of several wireless microphones operating on one channel requires a lower power limit than white space devices or currently operating wireless microphones. The Commission's conclusions did not factor in evidence in the record that body attenuation will decrease interference potential by a significant margin, therefore enabling wireless microphones to operate in the same channel and at higher power (50 mW) without causing harmful interference to wireless handsets.[16]

As other wireless microphone manufacturers have demonstrated, there will be limited utility in a wireless microphone that must operate in the noisy environment of these bands at such low power. Given the economies of scale required of equipment manufacturers, the FCC cannot expect that manufacturers will develop a niche product that is only capable of operating on limited bandwidth and that is subject to greater risk of interference from 600 MHz wireless licensees. The 20 mW power limit should be reconsidered.

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[15] CTIA Opposition at 6-7.

[16] *See* Reply Comments of Shure Incorporated, ET Docket No. 14-165, at 29-31 (filed Feb. 25, 2015).

C. The 30 MHz Limit on Spectrum Access for 1.4 GHz Should be Reconsidered.

CTIA opposes reconsideration of the 30 MHz allotment for wireless microphone use of the 1.4 GHz band, claiming that the Commission's decision was premised on sufficient information in the record. There is no rational basis for this limit, and it was not proposed during the course of the proceeding. CTIA, in its submissions, sought either non-allocation of the band for wireless microphone use or, at a minimum, limited access to all "new spectrum bands to a similar amount of spectrum (twelve megahertz)" that, in CTIA's estimation, was removed from wireless microphone use.[17] The Commission clearly did not adopt either of these suggestions, and there is no link between them and the rule adopted.

Further, there is no nexus between spectral efficiency and the 30 MHz limit, as CTIA claims.[18] Wireless microphone manufacturers already offer spectrally efficient equipment, particularly for high-end applications, which is the Commission's intended user for the 1435-1525 MHz band. Wireless microphone licensees staging major events that require 1.4 GHz spectrum have demonstrated that they densely pack audio channels into spectrum available for microphones, and therefore operate efficiently.

AFTRCC agrees that the 30 MHz limit is unnecessary, noting "[i]n terms of coordinating wireless microphone proposed uses in the band, the 30 MHz restriction adopted by the *Order* offers no particular advantage to AFTRCC as coordinator or to its members as users of the AMT spectrum for flight testing."[19] Indeed, this "command and control" regime of limiting spectrum access is not in keeping with the Commission's 21st Century efforts to modernize its spectrum

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[17] Letter from Scott K. Bergmann, Vice President, Regulatory Affairs, CTIA, to Marlene C. Dortch, Secretary, Federal Communications Commission, Dockets. 14-165 and 14-166 (filed July 10, 2015).
[18] CTIA Opposition at 9.
[19] Comments of AFTRCC at 3.

policy.

There is a current, demonstrated need for licensed wireless microphones to access more than 30 MHz of the 1.4 GHz band during major events. FCC Enforcement Bureau Chief, Travis LeBlanc, recently boasted about the successful Super Bowl production:

> A little known fact is that the Super Bowl represents one of the largest uses of wireless communications and spectrum every year. Whether in the vicinity of the stadium or streaming the game online, the wireless network traffic is immense. From television and radio broadcasters' **wireless video cameras and microphones, to wireless mics, cameras, and special effects** for Lady Gaga singing the National Anthem, and Beyoncé, Coldplay, and Bruno Mars performing at halftime, and of course, the teams, fans and stadium -- **all use a tremendous amount of spectrum**.[20]

Major productions, such as the Super Bowl, that Americans are accustomed to seeing may not be produced at the same level of sophistication if the FCC allows the current 30 MHz restriction to stand. CTIA states that the "amount of spectrum sought by wireless microphone manufacturers is significantly in excess of that presently available to them."[21] This is incorrect. The auction is likely to repurpose at least 100 MHz in the upper UHF TV band, and TV stations that opt to remain on the air will be consolidated in the lower UHF band, blocking even more channels from wireless microphone use. Access to 1.4 GHz, allowed only on a limited and secondary basis, does not compensate for the loss of UHF spectrum for wireless microphone use.

Relying on the STA process for access to more than 30 MHz would be unwieldly and administratively inefficient for both the Commission and licensees, and is not prudent policy. AFTRCC states that requiring STAs does not benefit its task, which is to ensure that the proposed wireless microphone licensee poses no risk of interference to the primary users of the

[20] Travis LeBlanc, "No (Pass) Interference at Super Bowl 50," FCC Blog Post (Feb. 11, 2016).
[21] CTIA Opposition at 2.

band.[22] Given that the Commission has provided notice that microphones manufactured for the 1.4 GHz band should be designed "flexibly," in the event that "regulatory circumstances ever change,"[23] there is no reason to limit access to 1.4 GHz band at this time. To the extent that the frequency coordinator determines that spectrum is necessary and would not cause interference, wireless microphone licensees should have access up to the full 1435-1525 MHz band.

D. The White Space Databases Should be Fast Responding and Reliable.

CTIA seeks to ensure accuracy in the white spaces databases.[24] Sennheiser agrees, and asks that the FCC makes certain that the databases are able to clear channels quickly and reliably for licensed wireless microphone use.[25]

CONCLUSION

The Commission should reconsider certain new rules regarding wireless microphone use, as set out in Sennheiser's Petition for Reconsideration and Response. And contrary to the CTIA Opposition, the FCC should conform the new out-of-band emission limits to the ETSI standard as a whole, increase allowable power for the Duplex Gap and Guard Bands to 50 mW EIRP, and allow wireless microphone licensees access to the entire 1.4 GHz band to the extent the

[22] Comments of AFTRCC at 3.
[23] Mic Opportunity R&O at ¶ 121.
[24] CTIA Opposition at 9-11.
[25] Sennheiser Opposition and Response, ET Docket No. 14-165, at 8-9 (filed Jan. 27, 2016).

frequency coordinator concurs.

Respectfully submitted,
/s/
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March 10, 2016

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