

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of:)	
)	
Amendment of Parts 15 and 74 of the Rules for)	ET Docket No. 21-115
Wireless Microphones in the TV Bands, 600 MHz)	
Guard Band, 600 MHz Duplex Gap, and the)	RM-11821
941.5-944 MHz, 944-952 MHz, 952.850-)	
956.250 MHz, 956.45-959.85 MHz, 1435-)	
1525 MHz, 6875-6900 MHz and 7100-7125)	
MHz Bands)	

**REPLY COMMENTS OF
THE NATIONAL ASSOCIATION OF BROADCASTERS**

I. INTRODUCTION AND SUMMARY

The National Association of Broadcasters (NAB)¹ hereby replies to comments submitted in response to the Commission’s Notice of Proposed Rulemaking (NPRM) concerning the use of licensed and unlicensed wireless microphones in the broadcast television bands and other spectrum bands.² NAB’s initial comments in this proceeding laid out a reasonable path for adoption of rules permitting the use of Wideband Multichannel Audio System (WMAS) technology on a secondary basis to help relieve spectrum congestion in situations where a large number of wireless microphones are needed. We urged the

¹ The National Association of Broadcasters (NAB) is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

² *Amendment of Parts 15 and 74 of the Rules for Wireless Microphones in the TV Bands, 600 MHz Guard Band, 600 MHz Duplex Gap, and the 941.5-944 MHz, 944-952 MHz, 952.850-956.250 MHz, 956.45-959.85 MHz, 1435-1525 MHz, 6875-6900 MHz and 7100-7125 MHz Bands*, Notice of Proposed Rulemaking, ET Docket No. 21-115, FCC 21-46 (April 22, 2021) (NPRM).

Commission to adopt reasonable restrictions on the use of WMAS technology that recognized that WMAS has a greater potential for interference and is not compatible with the universe of legacy narrowband wireless microphone deployments. Accordingly, we urged the Commission to restrict the use of WMAS technology to cases where it would actually achieve the Commission's stated goal of increasing spectrum efficiency, allow WMAS use only by licensed users and adopt proposed power restrictions to reduce the risk of interference to other users.

We respectfully disagree with initial comments that would lead to an imbalanced outcome and fail to achieve the gains in spectral efficiency that are central to this proceeding. While we continue to support the use of WMAS technology on a secondary basis subject to reasonable restrictions, we urge the Commission to authorize WMAS only on terms that will actually help alleviate spectrum congestion rather than risk making it materially worse.

II. THE COMMISSION MUST ADOPT RESTRICTIONS TO ENSURE THAT WMAS OPERATIONS ACTUALLY IMPROVE SPECTRUM EFFICIENCY

As NAB has already observed, the fundamental purpose of this proceeding is to “advance an important Commission goal of promoting efficient spectrum use.”³ Because WMAS systems occupy *more* spectrum than traditional wireless microphone systems, they should only be used under circumstances and subject to restrictions that will enhance, rather than detract, from the efficient use of spectrum.

It is puzzling, then, that some commenters urge the Commission to permit WMAS operations that achieve essentially no efficiency improvements over traditional narrowband analog systems. Shure and Waves Audio, for example, ask the Commission to require only

³ NPRM at ¶ 1.

three audio channels per megahertz⁴ while Sennheiser asks the Commission to impose no efficiency requirement whatsoever.⁵

A standard of only 3 ch/MHz would represent no improvement at all over traditional narrowband wireless microphone systems. Waves claims that 3 ch/MHz is “challenging” using current systems; it does not claim 3 ch/MHz is unachievable. Further, the challenges Waves cites, such as inter-modulation interference, would only arise if narrowband microphones were each using a full 200 kHz audio channel with no filtering or power control.⁶ In other words, even in a worst-case scenario where operators are making no effort to operate efficiently, 3 ch/MHz may prove challenging but not impossible. NAB submits that in many real-world operations it is far from a challenging standard and that 5 ch/MHz is readily achievable using current technology with reasonable and prudent engineering practices. For WMAS technology to represent an actual improvement in spectrum technology, then, the Commission should impose a requirement of no less than 6 ch/MHz.

Sennheiser’s position, that the Commission impose no efficiency requirement at all is plainly unreasonable and contrary to the Commission’s goals in this proceeding. Imposing no efficiency requirement whatsoever could easily lead to the use of WMAS technology in cases where such use would increase, rather than decrease, congestion in an already challenging spectrum environment. Indeed, Sennheiser itself acknowledges that “in the vast majority of use cases, WMAS will be operated using 24 or even more channels within a 6 MHz TV

⁴ See Comments of Waves Audio Ltd at 5, ET Docket No. 21-115, RM-11821 (Aug. 2, 2021) (Waves Comments); Comments of Shure Incorporated at 13, ET Docket No. 21-115, RM-11821 (Aug. 2, 2021) (Shure Comments).

⁵ Comments of Sennheiser Electronic Corporation at 4-5, ET Docket No. 21-115 (Aug. 2, 2021) (Sennheiser Comments).

⁶ Waves Comments at 5.

channel, while providing the same or better performance and fidelity as conventional narrowband wireless microphones.”⁷ In the “vast majority of use cases,” then, Sennheiser concedes that a minimum standard of 4 ch/MHz is easily achievable.

Sennheiser nevertheless asserts that any minimum requirement for could actually undermine efficiency. As an example, Sennheiser suggests a music festival where a large act could be using dozens of audio channels using WMAS technology, while at the same time a solo performer needing only a couple of audio channels could be ineligible to use WMAS – and thus forced to use narrowband microphones in an alternate 6 MHz TV channel.⁸ But this purported issue is entirely solved by NAB’s proposal that the Commission limit use of WMAS to situations where a large number of audio channels are needed and all channels are under control of a single entity.

Music festivals, to take Sennheiser’s example, typically hire a single company to provide sound reinforcement who would be the responsible entity for the event, including any necessary frequency coordination. The festival would be permitted to use WMAS technology as long as the event was using at least 10 audio channels for some portion of the event. If a large act needs 40 audio channels and a solo act needs only two, the sound company can continue use the same WMAS system and would not be expected to provide an entirely separate, narrowband system for the solo act. If none of the acts in that festival needed 10 channels or more, however, there is no reason to permit it to use WMAS technology in the first place because the spectrum efficiency improvements of this technology are realized only when *many* audio channels are being used by a single entity at a particular location.

⁷ *Id.* at 4.

⁸ Sennheiser Comments at 5.

III. THE COMMISSION SHOULD LIMIT WMAS USE TO LICENSED OPERATIONS

NAB continues to urge the Commission to permit WMAS operation only by licensed users to ensure that, if interference issues arise, they can be promptly identified and remedied. WMAS is intended to support large numbers of audio channels and indeed the efficiency advantages of WMAS only come into play where a large number of audio channels are required.⁹ Under the Commission's rules, unlicensed users routinely employing 50 or more audio channels are eligible to apply for licensed status.¹⁰ As a result, entities that would realize efficiency gains through WMAS are likely to qualify for a license.

In their comments, Sennheiser and Shure nevertheless urge the Commission to permit unlicensed users to take advantage of WMAS technology to allow for more efficient use of spectrum.¹¹ Shure in particular asserts that some professional but unlicensed users may routinely require the use of a large number of channels, but fewer than the 50 that would qualify them for a license.¹²

We understand that Sennheiser and Shure want to sell WMAS technology to the largest possible user base but allowing use of this technology by unlicensed users creates an unacceptable risk of harmful interference that would be impossible to address promptly. If Sennheiser and Shure are concerned that a large group of potential users fall into a gap where they use a sufficient number of channels to warrant WMAS operations, but not enough to qualify for a license, the most reasonable solution would be to consider adjusting the

⁹ Comments of the National Association of Broadcasters at 6-7, ET Docket No. 21-115, RM-11821 (Aug. 2, 2021) (NAB Comments).

¹⁰ See, e.g., 47 CFR §§ 74.801, 15.713(j)(8).

¹¹ Sennheiser Comments at 8-9; Shure Comments at 4-6.

¹² Shure Comments at 4.

number of channels needed to qualify for a license. Such a change is likely outside the scope of this proceeding but NAB would be willing to work with other stakeholders and the Commission to set a reasonable threshold that would expand opportunities for licensed WMAS operation.

IV. THE COMMISSION SHOULD LIMIT WMAS POWER TO 250 MILLIWATTS EIRP

We continue to support the Commission's proposal to limit WMAS systems to 250 mW EIRP in the UHF television bands, regardless of the bandwidth of the WMAS operation.¹³ In particular, the Commission should reject Shure's request to allow power spectral density (PSD) levels of up to 750 mW per megahertz for WMAS operations for two primary reasons.

First, as the Commission states, Sennheiser's Petition for Rulemaking did not request higher power for WMAS devices than the Part 74 rules currently allow for wireless microphones.¹⁴ Rather, Sennheiser stated that WMAS devices would operate at a lower power spectral density which "allows frequency re-use at closer locations nearby, improving spectrum efficiency over a geographic region with heavy wireless microphone use, such as Broadway, The Strip in Las Vegas, and TV and movie studios."¹⁵ Shure claims that a limit of 750 mW per megahertz is equivalent to the 250 mW EIRP per device limit if the FCC adopts a 3 ch/MHz efficiency standard – but the animating principle behind WMAS operations is that they will allow *lower* PSD operations and that will increase efficiency.

¹³ NPRM at ¶ 27.

¹⁴ See NPRM at ¶ 26; see *also* Sennheiser Electronic Corporation Request for Amendment of Part 74 of the Commission's Rules to Advance the Use of Spectrum Efficient Wireless Microphone Equipment, RM-11821 (Aug. 17, 2018) (Sennheiser Petition).

¹⁵ Sennheiser Petition at 5-6.

Second, regardless of Shure’s claims of an equivalent co-channel interference potential from a 750 mW per megahertz PSD limit, wireless microphones do not usually operate at that maximum power. As the FCC acknowledges, “as a practical matter, wireless microphones generally operate at less than the maximum power the rules allow due to a number of considerations,” including battery power and reduced potential for interference to other devices.¹⁶ A 750 mW per megahertz limit, then, would represent a significant power increase from power levels generally used in real-world operations.

Finally, as NAB has emphasized previously, most digital television systems are believed to be less susceptible to narrowband co-channel interference than wideband interference at the same power level.¹⁷ Therefore, allowing wider bandwidths at the same power level as narrowband systems is likely to increase the potential for interference.¹⁸ For all of these reasons we urge the Commission to take a conservative approach to WMAS operations at the outset, to allow stakeholders an opportunity to gain experience with real-world operating conditions while reducing the potential for interference to other services.

V. THE COMMISSION SHOULD REQUIRE WMAS SYSTEMS TO RESPECT EXISTING CHANNEL PLANS

In its initial comments, Waves Audio proposes allowing WMAS operations with bandwidths of up to 20 MHz regardless of the channel plan of the band where they operate.¹⁹ There are at least three problems with this proposal. First, allowing WMAS operations across portions of multiple channels will make interference analysis more difficult. Second, confining

¹⁶ NPRM at ¶ 25.

¹⁷ See, e.g., ITU-R Recommendation BT.1368-13, “Planning criteria, including protection ratios, for digital terrestrial television services in the VHF/UHF bands” (2017).

¹⁸ NPRM at ¶ 28.

¹⁹ Waves Comments at 6-7.

WMAS operations to channel bandwidths in a given band will help reduce the potential for interference to other services. Finally, Waves' proposal of a 20 MHz maximum bandwidth, even in bands with larger channels, is unduly restrictive.

For example, 6 MHz channels are specified in the broadcast television band, while 25 MHz channels are specified in the 7 GHz band under Parts 74 and 101. Waves' proposal of channel bandwidths of up to 20 MHz would allow WMAS operations to occupy portions of four television channels, which could have significantly different viewing patterns and interference conditions. Conversely, in the 7 GHz spectrum where 25 MHz channels are specified, there is no reason to limit bandwidth to 20 MHz; indeed such a limit would be needlessly inefficient by requiring spectrum to remain unused. NAB continues to urge the Commission to require that WMAS systems confine their emissions within the channel bandwidths specified in the rules or industry standards.

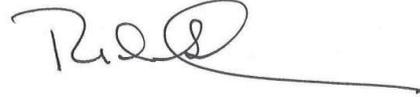
VI. CONCLUSION

NAB continues to support the Commission's efforts to increase spectrum efficiency for wireless microphones through this proceeding. Those efforts, however, must include reasonable restrictions to ensure that end users can operate WMAS technology without increased risk of interference to other spectrum users and that WMAS technology actually enhances, rather than decreases, the efficient use of congested spectrum. We look forward to working with the Commission and other stakeholders in this proceeding to develop final rules that will facilitate the use of WMAS technology moving forward.

Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Rick Kaplan", with a long horizontal line extending to the right from the end of the signature.

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