BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington D.C. 20554

In the Matter of	)	
	)	
Unlicensed Operation in the TV Broadcast Bands	)	**ET Docket No. 04-186**
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	)	
Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band Innovation Test-Bed	)	**ET Docket No. 02-380**
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COMMENTS OF
THE PROFESSIONAL AUDIO MANUFACTURERS ALLIANCE

The Professional Audio Manufacturers Alliance, or PAMA, was founded in March 2003 to be the voice and advocate for a unified professional audio industry. PAMA strives to promote the growth and well-being of our members in the professional audio industry, which include six of the leading wireless microphone and professional wireless audio manufacturers, representing collectively over 80 percent of the U.S. market.[1]

I. Introduction

PAMA's members are profoundly concerned about the issues raised for wireless microphones regarding the proposed introduction of unlicensed devices ("UDs") in the heavily used TV broadcast bands ("TV bands") pursuant to the Further Notice of Proposed Rulemaking ("FNPRM") released by the Commission on October 18, 2006.[2] The many professional wireless

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[1] PAMA members include AKG Acoustics, a division of Harman Professional of Northridge, CA; Audio-Technica U.S. of Stow, Ohio; Sennheiser Electronic of Old Lyme, CT; Shure Incorporated of Niles, IL; Sony Electronics of Park Ridge, NJ; and Telex Communications of Burnsville, MN.

[2] *Unlicensed Operation in the TV Broadcast Bands*, First Report and Order and Further Notice of Proposed Rulemaking, ET Docket Nos. 04-186, 02-380, FCC 06-156, ¶ 22 (released Oct. 18, 2006) ("*FNPRM*"). For convenience, PAMA refers to the new devices to be introduced to the TV bands as "unlicensed devices" or "UDs," even though the Commission is still considering whether to adopt a licensed or unlicensed regime.

microphones that already operate in the TV bands are a ubiquitous and irreplaceable tool for the entertainment and broadcast/production industries that stand to be rendered unusable by a rushed introduction of UDs. Because professional wireless microphones are so reliable and transparent, it has become easy to overlook the fact that contemporary televised sporting events, live musical performances, Broadway theater productions, news programming, religious services, and many other sources of media content that define American culture cannot be enjoyed by the public on a large scale without them. Therefore, it is of the utmost importance that the rules being drafted now by the Commission provide the express protection that wireless microphones require to continue functioning without interference before new devices are allowed in the TV bands. Although the FNPRM has stated that it will protect "other incumbent[s]" in the TV bands, it does not provide sufficient assurance that there will be full protection for wireless microphones from the potential interference created by unlicensed devices.[3] The Commission must act now to adopt explicit interference mitigation solutions specifically designed to protect important wireless microphone operations.

At a minimum, PAMA implores the Commission to set aside spectrum where wireless microphones will be able to operate free from UDs, to create a mechanism that will guarantee the availability of the spectrum needed for crucial wireless microphone operations at live events such as the Super Bowl or Grammys where literally hundreds of microphone channels are needed, and to establish meaningful rules that require UD manufacturers to demonstrate that spectrum sensing works properly and is more than smoke and mirrors. Finally, the Commission should defer consideration of the complex interference issues raised by personal/portable devices until after positive experience is gained with fixed devices.

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[3] FNPRM, at ¶ 2.

II. Wireless Microphones Serve an Important Public Function to Disseminate News, Entertainment, Sports, Religious, Educational and Political Content to the Public

In recent decades wireless microphones have proliferated throughout the broader entertainment and broadcast/production industries and are an integral component to bring various events central to the American culture to the American public. Sporting events rely on wireless microphones for internal team communications as well as sideline and courtside reporting.[4] Broadcast programming and film and video productions make extensive use of wireless microphones for capturing dialog during outdoor scenes where boom microphones are impractical, and for audience and ambience mixing. Television and radio news broadcasters use wireless microphones for field reporting and news gathering. In addition, wireless microphones are heavily used at all large venues where presenters or performers require the ability to move while simultaneously projecting their voices, including Broadway theater performances, theme parks, political conventions, religious services, school events and business conferences. Regardless of whether the ultimate transmission medium to the recipient of the content is a live amplified voice, cable facility, over-the-air radio or television broadcast, or communications satellite, it is increasingly more likely that the content was created initially with a wireless microphone.

Wireless microphones have in fact become so ubiquitous, and the entertainment and information industries now rely so thoroughly on them, that it would be virtually impossible to return to wired microphones. The prospect of hardwiring the various professional users noted above has become completely impractical and would likely prove difficult at best. Forcing the current class of professional users to rely on wired microphones would hamper news teams,

[4] At the recent national championship football game between Ohio State University and the University of Florida, it has been reported that each team coordinated in excess of 40 microphone channels for their own communications requirements before the broadcasters and sideline reporters began their own frequency coordinations.

make sideline or courtside reporting difficult or impossible, and would greatly diminish the audio quality of theatrical performances, movies, and religious services. In particular, live performers that have designed stages and theatrical sets around wireless microphones would suffer greatly if forced to revert to wired microphones. Certain live performances that incorporate acrobatics and place a high priority on mobility might simply be forced to stop production altogether. There is simply no turning back the clock and reintegrating wired microphones without inflicting significant harm on the entertainment, sports and information industries and the viewing public.

III. The Commission Does Not Adequately Protect Wireless Microphones

Acknowledging that incumbents beyond the digital television broadcasters need protection falls far short of the measures that the Commission must take to guarantee that wireless microphones continue to work with the high levels of reliability the entertainment, sports and information industries and the U.S. public has come to expect. Wireless microphones are precision instruments with unique transmission characteristics. Moreover, their transmission characteristics are dramatically different than other incumbents in the TV broadcast bands. "Cookie-cutter" rules will not adequately protect wireless microphones, if they offer any protection at all. Wireless microphones require express protection in the FCC Rules with specialized interference mitigation requirements thoughtfully designed to preserve wireless microphone functionality.

Wireless microphones have unique transmission characteristics that share virtually no common traits with the other incumbents in the TV bands. Wireless microphones are low powered, and typically transmit with 50 mW of power or less over 200 KHz of allocated bandwidth. Much of this power is then absorbed into the body of the microphone user. Further, wireless microphones operate intermittently, and their light and intermittent radio-frequency signature will be a challenge for third parties to detect and avoid. In stark contrast, a digital

television station will generally radiate a constant transmission using thousands or millions of watts from a large elevated antenna. Due to this enormous discrepancy in the characteristics of the incumbent services that occupy the TV bands, a "cookie-cutter" approach for drafting protection rules will fail to offer wireless microphones the protection they need. Wireless microphones require particularized interference solutions to protect their important operations.

PAMA would like to emphasize that despite the low-powered nature of wireless microphone transmissions, microphone failures during live performances are rare in today's operating environment. This extremely high level of reliability is due to the painstaking efforts taken to coordinate frequencies every time multiple wireless microphones are used in a professional production. At large events, frequency coordinators may begin the process of clearing channels for individual microphones weeks in advance of a production. In metropolitan areas, coordinators typically have intimate knowledge of the exact frequencies where broadcasters, theatrical productions, news organizations and other entities have assigned their microphones channels.

This delicate balance that allows low-powered wireless microphones to operate with extremely high levels of reliability will be turned upside down in a world where UDs flood the TV broadcast bands en masse. If the Commission does not take proactive measures to protect wireless microphones, thousands of frequency-hopping UDs could inadvertently threaten mass media as we know it today. A UD that jumps onto an occupied frequency could disrupt the national anthem at a major sporting event, the audio at a major Broadway production, or shut down production on a major motion picture. The severity of the problem will be significantly increased due to the inability to coordinate with an anonymous device whose ability to hop from frequency to frequency is uncontrollable. The harmful effects from this type of disruption will

be widespread throughout the entertainment and information industries, and very apparent to the viewing audience. When audio disruptions occur, even if the problem only lasts for a brief moment, it is engrained on the audience. Widespread interference to wireless microphones from UDs would be debilitating for all the industries that rely on them and would obviously not be in the best interest of the American public.

IV. Wireless Microphones Require Multiple Interference Protections to Preserve Their Functionality

In order to fully protect wireless microphones and ensure that UDs will not render an effective and highly reliable communications tool completely unusable, the Commission must incorporate targeted wireless microphone interference protections into its proposed rules. PAMA emphasizes that all of the protections set forth below are necessary to protect the wide range of wireless microphone applications. Specifically, the Commission must set aside spectrum where wireless microphones can operate free from UDs, create a mechanism that will guarantee the short-term availability of the spectrum needed for wireless microphone operations at live events such as the Super Bowl, require UD manufacturers to prove conclusively that spectrum sensing works effectively in real world conditions when UDs are present, and defer analysis of personal/portable UDs until it can be shown that introducing fixed UDs to the marketplace did not harm incumbent services. Without these steps, UDs will cause harmful interfere to wireless microphones and disrupt the multitude of productions that rely on their function.

Wireless microphones need clean spectrum free from UDs within the larger TV band to ensure that important wireless microphone productions will be free from interference. Live news coverage, broadcast television production, and movie production are a few of the many important applications that are vulnerable to interference from UDs. One reliable way to ensure

protection from UDs is to designate certain channels in each geographic area to be a safe haven for wireless microphone operation.

Large-scale productions, however, will require a separate interference solution. The Super Bowl, the Grammy Awards, major political conventions, and other nationally televised events regularly utilize hundreds of microphone channels. Reserve spectrum by itself will not accommodate such events. PAMA urges the Commission to explore options for creating a protective zone around such events where UD transmissions would yield to wireless microphone transmissions. The beacon system under consideration by the Commission is one option for such a zone.

Many UD proponents have held out spectrum sensing as a one-stop-shop for interference mitigation. While PAMA is optimistic that at some future date this technology will be one individual element of an interference protection plan for TV band incumbents, it is unreasonable to assert that this technology is by any means a complete solution that is currently ready for "prime time." In the 5.8 GHz band where spectrum sensing tools have been deployed, there are only a handful of extremely high-powered and fixed incumbents. There is no comparison with the TV bands where many different incumbents with varied technical characteristics operate, many of which are mobile, itinerant and low powered. Further, no proponent of the technology has shown a working model designed to operate in the TV bands. To date, there is no evidence that any manufacturer has even started to build a prototype of a spectrum sensing device for the TV bands. This is an ominous sign, and a strong indicator that the technology is not ripe for this application. Before any UD is certified for the TV bands the manufacturers must demonstrate through comprehensive laboratory and field testing that this technology works to protect wireless microphones from interference.

V. The Commission Should Address UDs One Step at a Time

The Commission should also concentrate its efforts on defining interference protection rules related to fixed UDs. It is premature for the Commission to split its focus and consider the more difficult case of personal/portable UD operation while it is grappling with the simpler, but still complex, interference issues raised by fixed UDs. Industry through IEEE has devoted over two (2) years to analysis of fixed UDs, but has not yet begun consideration of personal/portable devices. Only after the Commission gains experience with fixed UDs and develops a track record of successful interference mitigation with the varied incumbents of the TV band would it be appropriate to proceed to the more difficult case of personal/portable UDs.

VI. Conclusion

PAMA commends the Commission for its laudable goals in this proceeding to promote broadband deployment. However, achieving these goals must not come at the expense of wireless microphones that serve the informational and entertainment needs of millions of Americans each day. Wireless microphones are so reliable and transparent, it may not be apparent that contemporary televised sporting events, live musical performances, Broadway theater productions, news programming, religious services, and many other sources of media content core to American culture cannot be enjoyed by the public without them. If wireless microphones are not fully protected, a multitude of productions, both large and small, will be adversely affected and the American public will be substantially harmed. Before new UDs are permitted to operate in the TV bands, it is critical that the Commission provide express measures designed and proven to protect wireless microphones so they will continue functioning reliably and without interference. These measures include designating channels where wireless

microphones can operate without risk of interference from unlicensed devices, developing a solution for large events, testing spectrum-sensing technology comprehensively in the laboratory and the field to ensure it effectively protects wireless microphones, and deferring consideration of personal/portable devices until sufficient positive experience is gained with fixed devices.

Respectfully submitted,

/s/

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