

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

In the Matter of)	
)	
Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698- 806 MHz Band)	WT Docket No. 08-166
)	
Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition)	WT Docket No. 08-167
)	
Amendment of Parts 15, 74 and 90 of the Commission's Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones)	ET Docket No. 10-24
)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions)	GN Docket No. 12-268

COMMENTS OF AUDIO-TECHNICA U.S., INC.

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Summary

The Commission has requested comment on proposals to expand Part 74 licensing eligibility and to promote more efficient spectrum use by wireless microphones. The Commission has also asked commenters to take into account proposals in its Incentive Auction proceeding to reduce the amount of spectrum allocated to television broadcasting where wireless microphones and unlicensed white spaces devices are permitted to operate. While the Commission's efforts to reclaim and repurpose television spectrum presents many complex challenges and requires it to balance the interests of many diverse stakeholders, it should not lose sight of the particular interference vulnerabilities of wireless microphones and should take those vulnerabilities into account as it conducts its incentive auction and reduces the amount of spectrum allocated to television broadcasting. Unlicensed wireless microphones will become increasingly reliant on the safe harbor channels to avoid interference from white spaces devices as the amount of TV spectrum is reduced and these channels must be retained at least in the short term.

Great strides have been made over the past few years to improve the spectrum efficiency of wireless microphones and the Commission should continue to let the marketplace develop innovative products and avoid imposing government mandated policies, such as a digital transition, that could stifle innovation. Instead, the Commission should revise its rules to encourage greater wireless microphone deployment into non-broadcast spectrum. For example, by making more frequencies available for wireless microphone use under Part 90, the Commission may provide incentives for smaller venues where unlicensed wireless microphones are used to relocate their operations out of the television broadcast spectrum. Additionally, new microphone systems have been developed that utilize ultra-wideband technology under Part 15 of the rules. Creating a new section under the existing UWB rules specifically tailored to wireless microphone operations could provide substantial incentives for even larger users to relocate their wireless microphone operations out of the television bands. These represent long term solutions to the spectrum squeeze that will follow the Incentive auction process.

Finally, action by the Commission to expand Part 74 licensing eligibility is long overdue. The Commission should adopt flexible eligibility criteria to ensure that database protection is available to protect wireless microphones in appropriate circumstances.

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COMMENTS OF AUDIO-TECHNICA U.S., INC.

Audio-Technica U.S., Inc. (“A-T”) submits these comments in response to the Public Notice released by the Commission’s Wireless Telecommunications Bureau (“WTB”) and Office of Engineering and Technology (“OET”) on October 5, 2012.¹ Specifically, in the Public Notice, WTB and OET have invited interested parties to update and refresh the record pertaining to two

¹ *The Wireless Telecommunications Bureau and the Office of Engineering and Technology Seek to Update and Refresh Record in the Wireless Microphones Proceeding*, WT Docket Nos. 08-166, 08-167, ET Docket No. 10-24, FCC Public Notice, DA 12-1570 (rel. October 5, 2012) (“*Public Notice*”).

specific issues raised in the *Wireless Microphones Further Notice*.² (1) whether the Commission should provide for a limited expansion of license eligibility that would permit some wireless microphone and other low power auxiliary station users, which currently operate in the TV broadcast spectrum on an unlicensed basis, to operate on a licensed basis under the Part 74 rules applicable to low power auxiliary stations (“LPAS”); and (2) what steps the Commission should take to promote more efficient use of this spectrum by wireless microphones.³ The *Public Notice* also requests that commenters take into consideration recent industry developments as well as related Commission proceedings, especially its recently commenced Incentive Auctions proceeding⁴ which proposes to auction spectrum currently allocated to television broadcasting and to repack the remaining television broadcast stations into a narrower spectrum band.

I. INTRODUCTION.

A-T has been dedicated to advancing the art and technology of electro-acoustic design and manufacturing since 1962. From a beginning in state-of-the-art phonograph cartridges, A-T

² *In the Matter of Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band, WT Docket Nos. 08-166; Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition, WT Docket No. 08-167; Amendment of Parts 15, 74 and 90 of the Commission’s Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones, ET Docket No. 10-24, Report and Order and Further Notice of Proposed Rulemaking, 25 FCC Rcd 643 (2010) (“Wireless Microphones Order”/ “Wireless Microphones Further Notice”).*

³ Unless otherwise indicated, the reference to wireless microphones in these comments should be deemed to include all wireless audio devices, including in ear monitors and similar products.

⁴ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268, Notice of Proposed Rulemaking, FCC 12-118 (rel. October 2, 2012) (“Incentive Auctions NPRM”).*

has expanded over the years into the design and manufacture of high-performance headphones, microphones, in-ear monitors, mixers and electronic products for home and professional use. In each new area, the company's goal has been to create innovative, problem-solving products. The results of these engineering and production efforts can be seen in the effective use of A-T products in a broad spectrum of applications. Audio-Technica microphones, for example, are found in daily use in major broadcast and recording studios, and relied upon by top touring musicians. A-T microphones are chosen for important installations and major events, such as the U.S. House of Representatives, the U.S. Senate, the Super Bowl, World Cup Soccer and the Olympics.

A-T has also been an active participant in the Commission's proceeding to allow unlicensed devices to operate within the television white spaces ("WSDs") and to establish rules to ensure that such operations do not interfere with licensed and unlicensed wireless microphones. A-T has not opposed allowing unlicensed operations on vacant television broadcast spectrum, but has asked the FCC to ensure that the particular interference vulnerabilities of broadcast low power auxiliary stations, particularly wireless microphones, are taken into account and fully addressed in any decision to allow unlicensed operation in the TV Bands. A-T also supported the Commission's decision to set aside up to two unoccupied television channels in each market free from unlicensed WSD operation for wireless microphone use given the very real interference potential to wireless microphone services posed by operation of unlicensed devices in the broadcast spectrum.

A-T has responded to the FCC's desire to develop technology solutions that will allow unlicensed wireless devices to successfully operate in the "white spaces" without disrupting existing licensed services. A-T has developed both analog and digital wireless microphone products that have advanced the state of the art through increased efficiency both within the television band and outside of that band. To this end, A-T has invested millions of dollars in the research, development, production and launch of the world's first ultra wide band ("UWB") digital wireless microphone. Additionally, A-T also manufactures a product line that operates on frequencies available for Part 90 eligibles (sometimes referred to as "traveling frequencies") and in the 2.4 GHz band. Accordingly, these comments address both long term and short term potential solutions to the challenges faced by the Commission in accommodating new WSD deployment in what is certain to be a shrinking amount of TV Band spectrum while at the same time protecting both licensed and unlicensed wireless microphone use from WSD interference.

II. INCENTIVE AUCTION PROPOSALS.

In its *Incentive Auction NPRM*, the Commission has set forth several complicated and detailed proposals to implement its plan to recapture television broadcast spectrum and repurpose that spectrum for commercial wireless services. These plans propose using forward and reverse incentive auctions to recapture and reallocate TV spectrum and repacking the remaining television broadcast stations within the remaining un-auctioned television broadcast spectrum. Given the complexity of the Commission's undertaking, the fact that participation in both auctions will be purely voluntary, and will yield different amounts of spectrum from market to market, it is simply not possible at this time to fully evaluate the impact of this proceeding upon

licensed and unlicensed wireless microphone users and unlicensed WSDs that are permitted to operate on unused television channels on a secondary basis. However, the Commission has correctly indicated that its spectrum auctions and television repacking can be expected to reduce amount of spectrum available in the core television bands for use on a secondary basis by licensed and unlicensed wireless microphone users and by WSDs.⁵

In the *Incentive Auctions NPRM*, the Commission has proposed several actions that it could take to ameliorate the potential reduction in available white spaces spectrum following the auction and repacking process. First, the Commission has indicated that it may permit unlicensed use in the guard bands that the Commission proposes to establish to separate mobile broadband and broadcast operations. The guard band would consist of 6 megahertz of spectrum, supplemented by any remainder spectrum (up to 4 MHz) resulting from the re-channelization of recaptured broadcast spectrum from 6 MHz to 5 MHz channels.⁶ The Commission has also considered the possibility that unlicensed wireless operations might be permitted in a portion of the duplex gap that its spectrum plan will require to prevent interference between uplink and downlink traffic in the auction spectrum.⁷ Third, the Commission is considering the possibility of creating protection zones for wireless medical telemetry service (“WMTS”) and Radio Astronomy Service (“RAS”) which currently operate at specific limited locations on channel 37 and making channel 37 (which has not been allocated for television broadcasting) available for

⁵ *Incentive Auction NPRM* at ¶¶ 224-225, 233.

⁶ *Incentive Auction NPRM* at ¶¶ 226, 234.

⁷ *Incentive Auction NPRM* at ¶ 178.

unlicensed operations outside of these protected zones, and possibly nationwide.⁸ As the Commission notes, the newly created guard band, the duplex gap and the possible use of channel 37 represent new spectrum available for unlicensed devices in addition to, and not in lieu of, any remaining white spaces spectrum and could help to offset the expected diminution of such spectrum following the auction and repacking process.⁹

A-T fully supports the Commission's proposals to ensure that spectrum remains available for unlicensed use even though these proposals are likely to be of greater benefit to WSD operations than unlicensed wireless microphones.¹⁰ However, *Incentive Auctions NPRM* goes beyond finding new spectrum that may be made available for unlicensed operations and indicates that the Commission would actually consider allowing WSDs to operate on the two channels of spectrum that it has reserved in each market for wireless microphone use.¹¹ This suggestion

⁸ *Incentive Auction NPRM* at ¶¶ 201-208, 237.

⁹ *Incentive Auction NPRM* at n. 198.

¹⁰ Because WSDs are no longer required to incorporate spectrum sensing and are expected to be deployed on a relatively ubiquitous basis, it can be anticipated that, in the short term at least, unlicensed wireless microphones in the TV Bands that do not qualify for database protection will be forced to migrate to the safe harbor channels established by the Commission. These channels will become increasingly important over the short term to protect unlicensed wireless microphone use as WSD deployment accelerates. In the long term, improvements in spectrum sensing capabilities and improvements in battery technologies that will enable such sensing to be incorporated in wireless microphone systems as well as WSDs could reduce or eliminate the need for an unlicensed wireless microphone safe harbor. However, at present, neither battery technology nor spectrum sensing is sufficiently developed to ensure that wireless microphones can operate without interference from WSDs outside of the safe harbor channels.

¹¹ *Incentive Auction NPRM* at ¶ 238.

ignores more than five years of White Spaces policy development and cannot be justified on any rational legal or policy grounds.

Initially, it should be noted that unlike wireless microphones, which have a long history of successful, interference free deployment within the TV Bands, WSD operations remain a big question mark. There has not yet been any substantial deployment of WSD technology within the TV Bands and the Commission has had no opportunity to observe or measure the impact of widespread WSD deployment on the RF environment. It is not known how many devices will be deployed, what those devices will look like or how they will be used. Nor does the Commission have any actual operating data that would enable it to determine whether the cognitive radio techniques utilized by WSDs (*i.e.*, the database) will be as effective as they are touted to be in preventing harmful interference following the mass deployment of those devices into the marketplace.

The Commission must not forget or ignore the fact that in originally advocating opening up the TV White Spaces for unlicensed use, WSD proponents made a number of claims that their devices could and would be equipped with spectrum sensing technology to ensure that their operations would not interfere with other users, including wireless microphones operating in the TV Bands. Based upon demonstrated interference concerns that WSD deployment presented to wireless microphone operations, the Commission's White Spaces rules, as originally adopted, required not only that WSDs be equipped with effective spectrum sensing capabilities, but also that WSDs be prohibited from operating on up to two white spaces channels between channels 21 and 51 in the 13 major markets where certain channels between 14 and 20 were reserved for

land mobile use. These “safe harbor” or “reserved” channels were created to ensure that wireless microphone operations would be protected from WSD interference.¹²

During the Commission’s equipment certification process for WSDs, it quickly became apparent that despite all the ballyhoo over spectrum sensing, none of the white spaces devices for which approval was sought could detect and avoid interfering with wireless microphones on a consistent basis. Simply put, spectrum sensing technology, a technology that holds great potential to improve spectrum efficiency and allow greater spectrum sharing was not, and still is not, ready for prime time. Despite the shortcomings in the current generation of spectrum sensing technology, or perhaps because of them, WSD proponents were able to convince the Commission on reconsideration of its White Spaces rules to remove the spectrum sensing requirement. However, in order to ensure that wireless microphones were protected from interference from WSDs that would be deployed without any spectrum sensing capabilities, the Commission expanded the protection afforded by the two safe harbor channels from the 13 original markets to all markets nationwide. In other words, the Commission decision to establish the two reserved channels for wireless microphone use on a nationwide basis was a *quid pro quo* for its decision to relieve WSDs from their obligation to protect unlicensed wireless microphones

¹² *Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, Second Report and Order and Memorandum Opinion and Order, 25 FCC Rcd 18661 (2008) (“Second TV White Spaces Order”).*

by incorporating effective spectrum sensing capabilities into portable/personal WSD equipment.¹³

From an interference perspective, not much has changed since the Commission adopted its current White Spaces rules. Wireless microphones (licensed and unlicensed) have continued to operate in the TV Bands without causing interference to primary licensed services and other users, WSDs have still not deployed on any major scale while the White Spaces databases that are central to WSD deployment have been developed and tested. While advances in technology continue to make wireless microphones more spectrum efficient, they still remain susceptible to interference from WSDs. Simply put, the interference concerns that underlay the current White Space rules, in particular the need to ensure that wireless microphones have some spectrum in each market that is free from WSD interference, remain as valid today as when those rules were originally adopted. To threaten an existing wireless microphones service that is highly demanded by consumers and industry and that has become intrinsic to the very fabric of our society merely to provide a small amount of additional spectrum for a technology that has not yet been deployed would be fool hardy, without even taking into account the significant amounts of additional spectrum in other bands that the Commission has recently proposed to make available for unlicensed use.¹⁴

¹³ *Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661 (2010) (“TV White Spaces Second MO&O”).*

¹⁴ On January 9, 2013 the Commission announced that it was preparing to make available up to 195 MHz of spectrum in the 5 GHz band for unlicensed WiFi use and indicated that this would

Based upon the record of the White Spaces proceeding developed over a number of years, the Commission should not allow WSDs to operate on the channels set aside for wireless microphone use. In the future, technological advances may allow WSDs and wireless microphones to operate on the same spectrum in close proximity without causing harmful interference to either service. Should such a scenario come to pass, it might be entirely appropriate for the Commission to revisit the need to set aside a safe harbor for wireless microphones in the TV White Spaces. However, as experience with spectrum sensing has demonstrated, new technologies should be deployed carefully, after adequate testing, and only after the Commission has gained real world data on the impact that WSD deployment has had on the RF environment in the TV White Spaces. Only then would it be possible for the Commission to fairly evaluate the impact of WSD deployment on wireless microphone operations. In any event, the Commission should not allow WSDs to operate on the safe harbor channels established to protect wireless microphones prior to reinstating the requirement that any White Space device that operates on those channels be equipped with fully functioning spectrum sensing technology that meets the standards established by the Commission in its original White Spaces rules.

III. EFFICIENT WIRELESS MICROPHONE DEPLOYMENT.

In the *Public Notice* the Commission seeks to refresh the record in the wireless microphone proceeding in which it has sought comment on additional steps it could take to

be the largest block of unlicensed spectrum to be made available since 2003. *FCC Chairman Julius Genachowski Announces Major Effort to Increase Wi-Fi Speeds and Alleviate Wi-Fi Congestion at Airports, Convention Centers, and in Homes with Multiple Devices and Users*, FCC Public Notice, (released January 9, 2013).

promote more efficient and effective operation of wireless microphones in the spectrum that remains for television broadcasting after the incentive auction and channel repacking process. With respect to wireless microphone operations within TV White Spaces, the *Public Notice* restates the Commission’s observation that “wireless microphones generally have operated inefficiently” and indicates that “while wireless microphone users may believe they need access to more spectrum, any such needs ‘must be accommodated through improvements in spectrum efficiency.’”¹⁵ The *Public Notice* states that the majority of wireless microphones that currently operate in the UHF TV Bands are frequency modulated devices that operate with a bandwidth of up to 200 kHz and that the maximum number of microphones that can operate on a single 6 MHz television channel “may be as few as six or eight” in order to avoid intermodulation interference among the devices.¹⁶ The *Public Notice* also notes that wireless microphone manufacturers Shure and Sennheiser have introduced digital wireless microphone systems that can allow from 12 to 15 wireless microphones to operate on a single 6 MHz channel and asks commenters to address whether the Commission should encourage or require a transition to digital wireless microphones in order to improve spectrum efficiency for these devices.¹⁷

A-T fully supports the Commission’s goal of increasing spectrum efficiency for wireless microphones and has devoted significant resources to advancing the state of the art in wireless

¹⁵ *Public Notice* at p.5, citing *Unlicensed Operation in the TV Broadcast Bands, ET Docket No. 04-186, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 02-380, Second Memorandum Opinion and Order, 25 FCC Rcd 18661, 18674 ¶ 29 (2010) (“TV White Spaces Second MO&O”).*

¹⁶ *Public Notice* at pp. 5-6.

¹⁷ *Public Notice* at p. 6.

microphone technology. However, in a rapidly evolving technology environment, A-T believes that spectrum efficiencies will be better achieved by allowing the market to operate freely rather than by governmentally-imposed measures. For example, A-T believes that a government mandated transition to digital microphones is misguided, will be counter-productive in achieving efficiency gains and rests on an incorrect assumption that digital microphones are inherently more efficient than analog microphones. A-T develops, designs and manufactures both analog and digital products and can state categorically that this is not the case.

In a digital wireless microphone installation, increasing the number of microphones that can operate within a set amount of bandwidth (*e.g.*, a 6 MHz television channel) largely depends on achieving improvements to compression schemes. However, even the most sophisticated schemes impose trade-offs in terms of signal quality and reliability in order to accommodate a larger number of microphones within a given amount of bandwidth. Digital compression schemes can decrease range and battery life, increase latency and significantly decrease overall audio quality which could make such systems unsuited for particular applications, such as musical performances, where audio quality is of paramount concern.

Furthermore, the Commission's assumption that accommodating six to eight microphones within a single 6 MHz channel represents the limits of analog technology is simply incorrect. Using intermodulation mitigation techniques, A-T has developed an analog wireless microphone product that allows more than 25 microphones to operate on a single 6 MHz channel without introducing the unwanted byproducts of digital operations, such as audio artifacts, latency, reduced range or increased battery drain. Such technology did not exist just a few short

years ago and it would be unwise and entirely unjustified for the Commission to preclude the possibility of further technology improvements in the future by requiring a transition from analog to digital wireless microphone operations.

Additionally, such a mandated transition will likely fail to account for the particular vulnerability of in-ear monitors to digital artifact and latency. Wireless in-ear monitors, have become a critical tool for performing artists and have allowed performers to substantially lower the volume needed to monitor their performances, and realize the corresponding health benefits to their long term hearing. However, to be effective, in-ear monitors must be capable of reproducing the highest quality audio signal and doing so in real time and without latency. For this reason, A-T would urge the Commission to ensure that its rules recognize the special benefits of in-ear monitors and to refrain from taking any action that would degrade the capabilities and benefits of this special subcategory of wireless audio devices. These benefits should be protected and should not become an unanticipated casualty in the quest to increase spectrum efficiency for wireless microphones generally.

The *Public Notice* also requests comment on whether the Commission should reduce the bandwidth for microphone operations from 200 kHz to 150 kHz over a period of time to improve spectrum efficiency.¹⁸ While A-T does not support the Commission's proposal to impose a digital transition for wireless microphone operations, it does support the Commission's goal of increasing the operating efficiency of wireless microphones. For example, A-T believes that, in the foreseeable future, it may be possible to phase in a reduction in the occupied bandwidth for

¹⁸ *Public Notice* at p. 6.

wireless microphones from the 200 kHz presently authorized under the Commission's rules to some lower number, perhaps 150 kHz, as long as manufacturers are given sufficient time to develop new products to meet this requirement and as long as existing equipment was appropriately grandfathered. The Commission should not forget that wireless microphone manufacturers supported generous rebate programs to help effectuate the Commission's decision to require microphones to cease operations in the 700 MHz Band and that many wireless microphone users incurred significant expenses (even with the rebates) to obtain compliant equipment with the expectation that the new equipment would be able to remain operational at least throughout its expected life cycle.

Additionally, the Commission should take into account that spectrum efficiency is not necessarily guaranteed merely by reducing the authorized occupied bandwidth permitted for each carrier employed in wireless microphone operations. Such efficiencies may be largely illusory in systems that employ multiple redundant carriers from a single source to avoid external interference. Accordingly, any proposals to modify the Commission's rules establishing the maximum occupied bandwidth allowed for wireless microphone operations should take into account the total occupied bandwidth required by each audio source in addition to the amount of bandwidth occupied by a single audio carrier.

IV. NON-BROADCAST SPECTRUM

The *Public Notice* invited comment on the issue of whether the Commission should take additional steps to authorize wireless microphone operations outside of the TV Bands.¹⁹ A-T believes that there are several actions the Commission could take to increase the availability of spectrum for wireless microphone operations, both in the short term and in the long term without negatively affecting other wireless services. A-T manufactures wireless microphone systems that operate outside of the UHF TV Band, including a system designed to operate on the travelling frequencies available for wireless microphones under Part 90 of the Commission's rules. A-T has also spent millions of dollars to develop and launch the world's first UWB digital microphone that meets the requirements for UWB operations under Part 15 of the Commission's rules. A-T believes that both of these spectrum resources provide opportunities for increased wireless microphone use that would not interfere with the existing operations of other users on those frequencies.

In the *Wireless Microphone Further Notice*, the Commission noted that its Part 90 rules permit wireless microphones to be operated on the following eight frequencies: 169.445 MHz, 170.245 MHz, 171.045 MHz, 171.845 MHz, 169.505 MHz, 170.305 MHz, 171.105 MHz and 171.905 MHz.²⁰ Operation on these frequencies is permitted at a power level of 50 milliwatts, with an emission bandwidth not to exceed 54 kilohertz. The entities eligible for such licenses

¹⁹ *Public Notice* at p.7; *Wireless Microphones Further Notice*, 25 FCC Rcd at 691-704 ¶¶ 107-151.

²⁰ 47 C.F.R. §90.265(b).

include commercial entities in general; educational, philanthropic or ecclesiastical institutions; clergy and hospitals, clinics or medical associations. The Commission notes that while the eligibility for licensing is broader under Part 90 than it is for Part 74, it appears that relatively few parties operate wireless microphones under the Part 90 rules. The Commission requested comments on steps the Commission should take to revise its part 90 rules to make them more useful to wireless microphone users.²¹

A-T fully agrees that the Part 90 licensing regime may present an appropriate alternative for at least some entities that do not qualify for the database protection that is currently extended to both licensed and a very limited class of unlicensed users. Even though the Commission is considering whether to expand Part 74 licensing eligibility beyond the strict categories that currently exist, the truth is that many wireless microphone users will still not qualify for database protection, either because they still would not meet revised Part 74 eligibility requirements or because the complexity and cost of the database registration process will discourage registration.

The principal impediment to greater wireless microphone use under Part 90 is the existence of too few channels. Although the Commission's rules designate up to eight channels available for use, a single entity would only be able to use up to three or four of those channels at the same time due to intermodulation effects. Accordingly, Part 90 frequencies are presently insufficient for anyone but the smallest users. A-T believes that expanding the number of wireless microphone frequencies available under Part 90 would allow Part 90 licensing to be a viable option for many smaller users, such as smaller houses of worship, smaller night clubs and

²¹ *Wireless Microphones Further Notice*, 25 FCC Rcd at 704 ¶¶ 150-51.

smaller business conferences. These venues have legitimate and important need for wireless microphones and providing a viable alternative to these users by increasing the number of available usable channels would provide those entities with an incentive to conduct wireless microphone operations outside of the TV Bands where spectrum demand is increasing at the same time that spectrum availability is expected to decrease.

In the *Wireless Microphone Further Notice*, the Commission asked for comment on whether it should authorize wireless microphone operations under rule Parts other than Part 74 and Part 90.²² A-T believes that such operations can and should be authorized under Part 15 of the Commission's rules under the provisions and procedures for ultra-wideband devices that operate on an unlicensed basis. A-T has successfully developed and deployed wireless microphone systems that utilize UWB technology and that currently operate at 6.150-6.650 GHz. A-T's UWB system has generated much excitement among audio professionals as it offers reliability, security, resistance to interference and professional sound quality at a price that is competitive with existing wireless microphone systems. Presently, however, the Commission's UWB rules place unduly restrictive limitations on UWB power levels. A separate mask is allowed for outdoor devices yet this mask was established 10 years ago when different operations were envisioned. The rules also currently require such power levels to be measured in a manner that does not represent how the product is used.

A-T believes that its UWB microphone product can provide the same level of interference protection to existing wireless operations outdoors as it does indoors. A-T's UWB

²² *Wireless Microphones Further Notice*, 25 FCC Rcd at 704 ¶ 151.

system operates below the ambient noise floor at -41 dBm and puts out less power than the unintended radiations from a typical a computer screen. Accordingly, any deployment of its UWB system would not pose any appreciable risk of interference to existing services. The unduly restrictive power limitations imposed on UWB devices were established over 10 years ago with the expectation that there would be millions of mass market devices using UWB technology. These power limitations reflect the very conservative approach taken by the Commission to ensure that the deployment of what was then a brand new technology would not interfere with existing services that operated over the large swath of spectrum used by UWB devices, an approach that was entirely appropriate at the time. However, the Commission has now had a decade of experience with UWB deployment and this experience should allow the Commission to revisit certain rule restrictions that impede the deployment of certain UWB devices, such as wireless microphones, that can be operated safely and securely indoors and outdoors without causing interference to other services.

A-T would urge the Commission to consider amending Part 15 to add a new subsection to its UWB rules that would govern wireless microphone deployment. Under this new section, wireless microphones would be permitted to operate both indoors and outdoors with a revised mask and power level measurement. Output power would be calculated based on a direct connection rather than EIRP. Basing power levels upon EIRP as the rules currently require significantly overstates the power output for wireless microphones as EIRP does not take into account that the absorption coefficients are quite high at 6 GHz for devices like wireless microphones that are hand held or worn on or close to the body.

A-T believes that UWB spectrum provides a significant opportunity to further the Commission's goals of increasing wireless microphone spectrum efficiency. By their nature, UWB devices operate on spectrum that dedicated to other uses and services and can simultaneously utilize this spectrum without disrupting or interfering in any way with the primary use. Furthermore, UWB spectrum can provide an attractive alternative for wireless microphone users when compared to TV Band spectrum that is in high demand and short supply due to its desirable propagation characteristics. Because wireless microphone systems typically operate in a range of 100 meters or less the higher frequencies available for UWB deployment are more than adequate to meet the needs of wireless microphone users and may actually be better suited for this purpose.

V. EXPANSION OF PART 74 ELIGIBILITY.

Licensed low power auxiliary stations (LPAS) operations are permitted on unused television broadcasting frequencies on a secondary, non-exclusive basis and are intended for uses such as wireless microphones, cue and control communications, and synchronization of TV camera signals. Authorized licensed LPAS operations are currently limited to certain enumerated entities, including radio and broadcast television stations, broadcast television networks, certain cable operators, and motion picture and television program producers. The Commission requests a refreshed comment record on whether to expand licensing eligibility under Part 74, Subpart H of its rules to include certain operators of unlicensed wireless microphones or other low power auxiliary devices at specified venues. The Commission also asks whether it should establish more specific eligibility criteria at a specific venue (*e.g.*,

requiring the same level of “professional” high production-quality audio as broadcast productions; involving a live production; or specific venue types or seating capacities) as a condition of expanding its LPAS licensing regime.

A-T continues to fully support the expansion of Part 74 licensing eligibility for wireless microphone users. There remains a legitimate need for and public interest in ensuring that certain commercial, cultural, political, educational, religious and sporting activities that depend on wireless microphones be able to operate free from interference by the current operation of unlicensed wireless devices (including unlicensed wireless microphones) and the future operation of WSDs. The demand for wireless microphone use at live events continues to grow. While most casual and recreational users of wireless microphones will continue to benefit from the convenience of unlicensed operations under Part 15, some users, particularly operators of larger-scale live events, often require more reliable and/or high-powered spectrum than is available under Part 15. Accordingly, the Commission should expand Part 74 eligibility beyond the narrow class of users currently permitted under Part 74.

The Commission should not just consider the size of an organization or type of application, as these limited criteria could deny protection for many legitimate and established wireless microphone uses. Specifically, Part 74 eligibility should be expanded to include all organizers of live events, including commercial enterprises (e.g., trade shows, exhibitions, theatrical productions, sporting events, etc.), non-profit organizations, educational institutions and houses of worship. To the extent the Commission requires a specific list of entities eligible for an LPAS license, A-T supports the list of nine categories of eligible entities recommended by

Shure: (i) indoor and outdoor seated facilities, including amphitheaters, arenas and stadiums; (ii) theaters; (iii) outdoor entertainment venues, including sites with lawn seating, amusement parks and fairgrounds; (iv) convention centers and business conference facilities; (v) educational and cultural facilities, including schools and museums; (vi) governmental facilities; (vii) houses of worship; (viii) lodging facilities and entertainment venues; and (ix) audio and video recording studios. However, A-T does not support limiting licenses to these specific venues only.

Because organizers of live events are likely to vary based on any number of factors, A-T urges the Commission to be flexible in expanding Part 74 license eligibility. For instance, as other commenters have correctly pointed out, an “organizer” may be a venue owner or operator, an event producer, an engineer, an event sponsor or a performer. Furthermore, in cases where facilities do not own their own equipment, the coordinator of frequency information could be the company supplying the rented sound equipment for the event and license eligibility should be extended to that company for purposes of accurate geolocation database entries. Just as the Commission should not restrict licenses to specific venues, it should not restrict licenses to any particular entities and allow other commercial enterprises, such as professional production companies, to be eligible for licenses.

Expanding Part 74 eligibility would not result in the mass licensing of every existing and future wireless microphone deployment. A-T maintains that the complexities and costs of the FCC’s licensing process, database registration and frequency coordination requirements will effectively deter smaller and mid-sized applications from seeking licensing protection where it may not be warranted, resulting in most users opting instead for unlicensed Part 15 operations.

Nevertheless, to the extent that the social and economic value of a particular use warrants the investment in licensing, that licensing protection should be afforded to the user even if the number of wireless microphones is limited or the size of the organization is small. For these reasons, A-T does not support the imposition of a revenue benchmark, numerical limits on applicant size, or the number of microphone channels deployed as gating criteria for license eligibility although such factors along with others may be taken into account in determining whether a particular venue, entity or event should qualify for Part 74 licensing. A-T also does not support the exclusion of any facility based on size or capacity. Neither the seating capacity nor the dimensions of a facility determines the quality of wireless audio system needed for a particular event or, standing alone, provides any rational basis for determining whether that venue should be protected from interference.

The success and effectiveness of an expanded Part 74 regime should be dependent on the accuracy and proper management of the licensing database rather than the number of licensed users in the database. The successful operation of multiple co-existing wireless devices in the RF environment will depend heavily on a thorough definition, evaluation, validation and impartial administration of a “TV bands database” system. To the extent that the Commission decides to adopt licensing eligibility criteria based on size or number of microphones deployed it should also make clear that, under its delegated waiver authority, the OET will continue to have the discretion to require that Part 74 protection and database access be afforded to entities that do not meet the gating criteria where such entities are able to demonstrate that such protection would serve the public interest.

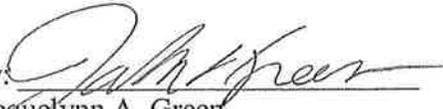
VI. CONCLUSION.

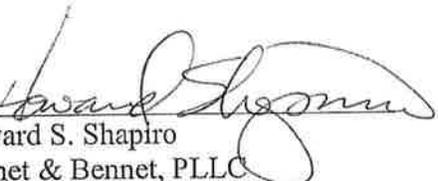
Based on the foregoing, A-T respectfully requests that the Commission keep in mind the particular interference vulnerabilities of wireless microphone services and take those vulnerabilities into account as it conducts its incentive auction and reduces the amount of spectrum allocated to television broadcasting. Unlicensed wireless microphones will become increasingly reliant on the safe harbor channels to avoid interference from white spaces devices as the amount of TV spectrum is reduced and these channels must be retained. The Commission should continue to let the marketplace develop innovative solutions to increasing microphone efficiency and should avoid imposing government mandated policies, such as a digital transition, that could stifle innovation. Instead, the Commission should revise its rules to encourage greater wireless microphone deployment into non-broadcast spectrum, including spectrum available under Parts 90 and Part 15. The Commission should also expand licensing eligibility under Part

74 to ensure that database protection is available to protect wireless microphones in appropriate circumstances.

Respectfully submitted,

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