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

In the Matter of	)	
	)	
Promoting Spectrum Access for Wireless Microphone Operations	)	GN Docket No. 14-166
	)	
Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions	)	GN Docket No. 12-268
	)	
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	)	

PETITION FOR RECONSIDERATION OF AUDIO-TECHNICA U.S., INC.

Pursuant to Section 1.429 of the Commission's Rules,[1] Audio-Technica U.S., Inc. ("A-T") hereby petitions the Federal Communications Commission's ("FCC" or "Commission") for reconsideration of both its *Wireless Microphone Report & Order*[2] and *Part 15 Unlicensed Report & Order*.[3] A-T has been dedicated to advancing the art and technology of electro-acoustic

[1] 47 C.F.R. § 1.429.

[2] *In the Matter of Promoting Spectrum Access for Wireless Microphone Operations; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions,* Report and Order, GN Docket Nos. 14-166; 12-268, FCC 15-100 (rel. Aug. 11, 2015) ("*Wireless Microphone Report & Order*").

[3] *In the Matter of 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 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,* Report and Order, ET

design and manufacturing since 1962. From a beginning in state-of-the-art phonograph cartridges, A-T 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 participated extensively in the above-captioned proceedings and generally supports the Commission's attempt to make additional spectrum available for wireless microphone use and to allow wireless microphones to continue to operate in portions of the UHF band following the planned broadcast spectrum Incentive Auction. However, as detailed below, there are several aspects of the two orders referenced above that require reconsideration by the Commission in order to protect consumers and ensure a smooth post-Incentive Auction transition.

I. THE COMMISSION SHOULD ADOPT THE ETSI EN 300-422-1 STANDARD WITHOUT MODIFICATION.

The Commission discusses adoption of ETSI emission mask standards for analog and digital wireless microphones beginning at paragraph 29 of the *Wireless Microphone Report &*

Docket No. 14-165, GN Docket No. 12-268, FCC 15-99 (rel. Aug. 11, 2015) ("*Part 15 Unlicensed Report & Order*").

Order and at paragraph 101 of the *Part 15 Unlicensed Report & Order*.[4] The Commission stated that it will require that "unlicensed wireless microphones comply with the same emission mask as licensed Part 74 wireless microphones,"[5] and that "emissions from analog and digital unlicensed wireless microphones [must] comply with the emission masks in Section 8.3 of ETSI EN 300 422-1 v1.4.2 (2011-08), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement*."[6] The Commission also stated that "[o]utside of the frequency range where the ETSI masks are defined (one megahertz above and below the wireless microphone carrier frequency), [it] 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."[7]

In prior comments in these proceedings A-T supported the Commission's proposal to adopt the ETSI emission mask in large part because of economic benefits that would accrue from using a common standard in Europe and the United States, specifically, the economies of scale that can be achieved by building products that can be used both overseas and the United States. However, the rule adopted by the Commission is actually more stringent than the ETSI standard because it specifies that all out of band emissions ("OOBE") must meet the -90 dB level, something that the ETSI standard itself does not require. Wireless microphones are designed to meet a global standard, and most models sold in the U.S. already comply fully with the ETSI standard as it has been implemented in Europe. However, this same equipment for the most part would not meet the new -90 dB requirement adopted by the Commission which is not part of the

[4] *Wireless Microphone Report & Order* at ¶¶ 29-32; *Part 15 Unlicensed Report & Order* at ¶ 101.
[5] *Part 15 Unlicensed Report & Order* at ¶ 101.
[6] *Wireless Microphone Report & Order* at ¶ 32.
[7] *Id.*; *see also Part 15 Unlicensed Report & Order* at ¶ 101.

ETSI standard to which that equipment has been designed. The Commission's overreach will vitiate any advantages or efficiencies gained by producing wireless microphone products for use worldwide. A-T urges the Commission to reconsider its decision to adopt the -90dB requirement outside of the frequency range where the ETSI masks are defined, and instead adopt the ETSI EN 300-422-1 v.1.4.2 OOBE limits without modification.

OOBE accuracy and compliance will be best controlled if there is a standardized level and global test method. By adopting this "add on" to the ETSI standard, the Commission will essentially require all equipment to be re-engineered. This re-engineering process will impose significant negative financial consequences on both manufacturers and end users. Further, to impose an additional requirement in the U.S. market will require test labs to change test methods and equipment. The upcoming 600 MHz Broadcast Incentive Auction and accompanying rule changes will already require all wireless microphones to become re-certified to ensure compliance with new conditions. There will already be a flood of equipment to be re-tested, and by adding a new, excessively stringent, and unfamiliar OOBE emissions measurement to the tests, the Commission may create a situation which stops the sale and use of wireless microphones for a significant time period.

In addition to causing costly inefficiencies, A-T is concerned that this additional stringent requirement is impractical and perhaps not even technically feasible. At best, the -90 dB spurious emission limit beyond +/- 1 MHz from the carrier/center frequency will be difficult to achieve. At worst, this limit could render all Part 74 wireless microphone systems – current and future – impossible to use and discourage future development of wireless microphones intended for licensed use outside of the TV bands.

Adoption of the ETSI rule "as is," and without modification already provides a

substantial improvement in OOBE limits. Current Part 74 limits OOBE to -13 dBm. Compliance with ETSI will allow for -54 dBm in the UHF band and -30 dBm above 1 GHz, which has already been used for years in the European Union. It has been proven in practice that this level is sufficient to protect adjacent services, including LTE, TV broadcast, and others. A more stringent standard: (1) is not practically achievable for these products; (2) would not result in any further improvement in spectral efficiency or inter-service interference at the low power levels at which wireless microphones operate; and (3) would cause significant unintended consequences for consumers in the marketplace.

II. WIRELESS MICROPHONES SHOULD NOT BE LIMITED TO 30 MHZ IN THE 1435-1525 BAND.

The Commission discusses licensed wireless microphone access to the 1.4 GHz band beginning at paragraph 116 of the *Wireless Microphone Report & Order*.[8] In that decision, the Commission authorized limited use of the 1.4 GHz band for licensed wireless microphone operations, with secondary status in the band in the table of allocations, provided that certain conditions and safeguards designed to protect aeronautical mobile telemetry ("AMT") services are met.[9] One of these conditions is that microphones operating in a particular area may not access more than 30 MHz in the band.[10]

The 30MHz use limit in the 1.4 GHz region is in direct conflict with the stated use of this spectrum for situations that require large numbers (100+) of wireless microphones. Operating 100+ wireless microphones in 30MHz is not possible using current technology, and new methods for increasing efficiency are unproven. Further, there is no technical or logistical reason to impose an arbitrary limit on how much spectrum should be made available for use by

[8] *Wireless Microphone Report & Order* at ¶¶ 116-122.
[9] *Id.* at ¶ 116.
[10] *Id.* at ¶ 118.

wireless microphones for a particular event. This decision should be made by the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") on the basis of actual need and the spectrum required for other purposes at a given place and time rather than by an arbitrary Commission rule.

III. THE COMMISSION SHOULD ALLOW POWER OUTPUT TO BE MEASURED ON EITHER A RADIATED (EIRP) OR CONDUCTED BASIS IN ALL BANDS.

The Commission discusses VHF band revisions and power output measurement beginning at paragraph 24 of the *Wireless Microphone Report & Order* and at paragraph 99 of the *Part 15 Unlicensed Report & Order*. The Commission states that it is revising its rules to "provide more opportunities for licensed wireless microphone use of these VHF channels," and to "specify the 50 mW limit in terms of EIRP."[11] The EIRP measurement option is a way to facilitate and encourage use of the VHF bands for wireless microphones, but A-T urges the Commission to permit the option of measuring power on either an EIRP or conducted basis in all bands.

The new rules change transmitter output power measurement to an EIRP, rather than conducted, basis in some areas of application. In order to meet the needs of wireless microphones, interruptible foldbacks ("IFB"), and in-ear monitors ("IEM") used in many applications, manufacturers must be able to choose between EIRP or conducted transmit output power measurement. Wireless microphones typically use a transmit antenna located at the flexible sound source, with a specific output power for reaching a fixed receiver. However, the reverse is true for IEMs and IFBs, wherein the transmitter is a fixed device that reaches a number of receivers worn by the user. The requirements for best antenna performance (and how to

[11] *Wireless Microphone Report & Order* at ¶ 24; *see also Part 15 Unlicensed Report & Order* ¶ 99.

measure output power) are different in these circumstances. If the Commission is concerned about the possible variation in transmit output power that could result by allowing the choice between EIRP or conducted transmit output power measurement,[12] A-T suggests using the ETSI EN 300-422-1 method for determining the output power specification. It is functional, proven in practice to avoid interference problems, and would allow standardized measurement and compliance.

IV. OUTPUT POWER IN THE DUPLEX GAP SHOULD BE INCREASED TO 50 MW FOR BOTH LICENSED AND UNLICENSED WIRELESS MICROPHONES.

The Commission discusses licensed and unlicensed wireless microphone operation in the duplex gap beginning at paragraph 102 of the *Part 15 Unlicensed Report & Order*.[13] The Commission states that it, "will allow unlicensed wireless microphones…to operate at 20 milliwatts EIRP in guard bands of any size."[14] In the 600 MHz duplex gap, the Commission will "require that unlicensed wireless microphones…operate at the same power limits as permitted in the 600 MHz guard bands, and that licensed wireless microphones operate at the same power limit as unlicensed wireless microphones."[15]

A-T is concerned that 20mW is not enough power to operate effectively in what is likely to be compromised "quality" spectrum – spectrum where the noise floor will be high and

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[12] *Part 15 Unlicensed Report & Order* ¶ 99 (noting that "specifying the power limit in terms of EIRP ensures uniformity in the maximum radiated power for all unlicensed wireless microphones").

[13] *Id.* at ¶ 102. *See also Wireless Microphone Report & Order* at ¶ 20 (stating "we do not address in this proceeding the technical rules for operations of unlicensed wireless microphones in the guard bands, including the duplex gap. Nor do we address here the technical rules for licensed wireless microphone operations in the duplex gap, since the technical issues relating to their operations are intertwined with the technical issues concerning unlicensed operations in the duplex gap and protection of licensed operations outside of the duplex gap").

[14] *Part 15 Unlicensed Report & Order* at ¶ 102.

[15] *Id.* at ¶ 103.

there will be significant ambient noise. Quite simply, the power level must be higher than 20mW to overcome such interference. A-T urges the Commission to increase output power in the duplex gap from 20 to 50mW for both licensed and unlicensed wireless microphones. With such action, licensed microphone power would still be decreased from 250mW to 50mW power. 50mW, unlike 20mW, is an effective power level in most circumstances, and has already been proven in practice to not interfere with adjacent services.

Requiring a 20mW level will force the complete re-design of all wireless microphone models so that they: (1) automatically reduce power if operated in the duplex gap; or (2) require manufactures and end users to utilize a second model to operate in the gap (which is very costly and inefficient). Since adoption of this rule at 20mW would require complete equipment re-design, but the frequency that must be used in the re-design is unknown, this places an undue burden on manufacturers. Sale and marketing must stop within 18 months of the channel reassignment notice, but this is not enough time to design, certify, manufacture, and market a new wireless microphone product. A 50 mW, rather than 20mW, power level will allow current designs to remain in place, and current products in use by customers to be utilized once re-certified to comply with ETSI EN 300-422-1 – a much better outcome for consumers.

V. THE COMMISSION SHOULD CLARIFY THAT WIRELESS MICROPHONES ARE EXEMPT FROM PART 15 RULES THAT WOULD PREVENT THE USE OF STANDARD CONNECTORS ON TRANSMITTERS.

The Commission discusses Part 74 wireless microphone operation and Part 15 wireless microphone certification beginning at paragraph 284 of the *Part 15 Unlicensed Report & Order*.[16] The Commission will "permit users…to operate Part 74 wireless microphones in the TV bands under the waivers already in place and in the 600 MHz service band until they must

[16] *Part 15 Unlicensed Report & Order* at ¶ 284.

cease those operations no later than 39 months after release of the *Channel Reassignment PN*."[17] The Commission stated that "[a]lthough these microphones are certified as compliant with Part 74 rules, the waiver requires that they be operated consistent with the Part 15 rules which we are now adopting in this proceeding."[18] Further, the Commission will accept applications to certify wireless microphones under new Part 15 rules as soon as those rules are effective, and will require applications to certify wireless microphones under new Part 15 rules nine months after the release of the Channel Reassignment PN or no later than 24 months after the effective date of the new rules, whichever occurs first.[19]

A-T is concerned that the current Part 15 rules will hinder wireless microphone users and manufacturers by preventing the use of standard connectors on transmitters. Section 15.203 provides that "[a]n intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited."[20] Section 15.204, too, could prevent the use of standard connectors on transmitters.[21]

Wireless microphones have unique requirements when compared with other Part 15 consumer products. Antenna combiners in multi-channel setups, use of omnidirectional or unidirectional antennas, and readily available replacements are necessary in order to accomplish

[17] *Part 15 Unlicensed Report & Order* at ¶ 285.
[18] *Id*.
[19] *Id.* at ¶ 286.
[20] 47 C.F.R. § 15.203.
[21] 47 C.F.R. § 15.204.

satisfactory performance given other technical restrictions. A-T has operated for years with standard connectors for antennas without creating any interference or technical problems, and urges the Commission to clarify that these Part 15 restrictions are not applicable to wireless microphones.

VI. CONCLUSION.

For the foregoing reasons, it is respectfully submitted that the Commission should reconsider the aforementioned decisions in the *Wireless Microphone Report & Order* and *Part 15 Unlicensed Report & Order*.

Respectfully submitted,

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