

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of	)	
	)	
Amendment of Part 15 of the Commission's	)	ET Docket No. 14-165
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 Duplex Gap	)	
	)	
Promoting Spectrum Access for Wireless	)	GN Docket No. 14-166
Microphone Operations	)	
	)	
Expanding the Economic and Innovation	)	GN Docket No. 12-268
Opportunities of Spectrum Through Incentive	)	
Auctions	)	

REPLY COMMENTS OF AT&T

I. INTRODUCTION

AT&T Services Inc. ("AT&T"), on behalf of the subsidiaries and affiliates of AT&T Inc. (collectively, "AT&T") hereby submits this reply to comments in response to the Commission's Notices of Proposed Rulemaking ("*NPRM*") regarding the impact of the upcoming broadcast incentive auction on unlicensed white space device and wireless microphone operations.¹ As

¹ In the "*Unlicensed NPRM*," the Commission invites comment on proposed rules for unlicensed operation of white space devices and wireless microphones in the post-auction market. *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 600MHz Duplex Gap*, Notice of Proposed Rulemaking, FCC 14-144, at ¶ 2 (Sept. 30, 2014) ("*Unlicensed NPRM*"). In a second Notice of Proposed Rulemaking ("*Wireless Microphones NPRM*"), the Commission seeks comment on existing and new spectrum bands and technologies that might accommodate wireless microphone users' needs. *Promoting Spectrum Access for Wireless Microphone Operations*, Notice of

discussed herein, AT&T supports the comments filed by CTIA – The Wireless Association® (“CTIA”) and urges the Commission to adopt technical rules that are consistent with the results of the V-COMM study.

AT&T is a supporter of unlicensed services and believes that there is room in the 600 MHz band for both licensed and unlicensed services. However, Congress’ express purpose in granting incentive auction authority was to reallocate TV broadcast spectrum to licensed use, assigning licenses for all spectrum cleared by the forward auction, less only such spectrum necessary for guard bands (including a duplex gap), and those guard bands must be no larger than absolutely necessary to prevent interference between licensed services.² The auction was not intended to clear spectrum for unlicensed uses.³ The possibility of allowing unlicensed services to use these minimal guardbands was not a purpose of the Act, but a permissible and conditional by-product of the auction process; to be permitted if, and only if such unlicensed uses would not “cause harmful interference to licensed services.”⁴

To comply with this mandate, the Commission will need to proceed with a clear understanding of the interference environment in the 600 MHz band. AT&T submits that the V-COMM study, commissioned by CTIA, offers the only detailed, technically sound foundation for assessing the interference potential of unlicensed operations and developing technical rules that

Proposed Rulemaking, FCC 14-145, ¶ 4 (Sept. 30, 2014) (“*Wireless Microphones NPRM*”). These NPRMs implicate many of the same issues, and thus, AT&T’s comments herein respond to both Notices.

² See Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No., 112-96, §§ 6403(c)(1)(A); 6407(b) (codified at 47 U.S.C. § 1452), 126 Stat. 156 (2012) (“Spectrum Act”).

³ See *id.* § 6403(c)(1)(A) (requiring the Commission to “assign[] licenses” for the use of reallocated spectrum during the forward auction).

⁴ *Id.* § 6407(e).

will ensure that licensed services are not impermissibly marred by harmful interference. Adopting technical rules based upon the V-COMM study results will also be critical to preserving the fungibility of the licensed spectrum. Indeed, if the Commission’s 600 MHz band technical rules are not carefully calibrated to prevent unlicensed operations from impairing adjacent spectrum blocks, the interchangeability of the licensed spectrum will be destroyed. By taking the actions proposed by CTIA and supported by the V-COMM study, the Commission will help foster a diverse 600 MHz ecosystem that preserves the fungibility of the licensed spectrum, protects the substantial investments of 600 MHz licensees, and complies with the Spectrum Act.

II. THE COMMISSION SHOULD ADOPT TECHNICAL RULES THAT ARE CONSISTENT WITH THE V-COMM STUDY

The Commission should use the findings and results of the V-COMM study as a roadmap for crafting the post-auction 600 MHz band technical rules. CTIA and its members commissioned the V-COMM study to help build a sound engineering framework for unlicensed operations that would “ensure the protection of licensed services from interference,” as required by the Spectrum Act.⁵ With extensive experience analyzing interference in different spectrum bands, V-COMM’s engineers conducted a variety of tests to emulate real world conditions.⁶

Importantly, the assumptions in the V-COMM study, which are explicitly documented, are fully consistent with standard wireless industry practices and sound engineering practices. The interference modeling provided by both the Commission and Broadcom, on the other hand,

⁵ Comments of CTIA – The Wireless Association®, ET Docket No. 14-165, GN Docket No. 14-166, GN Docket No. 12-268, at 4 (Feb. 4, 2015) (“CTIA February 2015 Comments”).

⁶ See *id.* at 7-8 (detailing the devices tested, interference sources, testing scenarios, and the conservative technical assumptions involved in the V-COMM study).

relies on flawed technical assumptions that do not reflect reasonable engineering practices or the longstanding global wireless standards designed to ensure protection from harmful interference.⁷ For example, Broadcom's analysis relies on a scattered assortment of measured and 3GPP standards values, selected carefully to further its best interests. In particular, Broadcom's study adds link budget losses that do not reflect the real world interference environment.⁸ As other commenters and the V-COMM study reveal, however, Broadcom's assumption of 15 dB of additional link loss is misplaced.⁹ The only losses that should be applied to the interference case between white space devices and licensed operations in the 600 MHz band is the 38 dB of aggregate link losses set forth in the V-COMM study.¹⁰ Indeed, the V-COMM study is the most recent—and by far the most detailed—study of harmful interference issues in the record in these proceedings. As such, the Commission should rely on the study's findings to pinpoint technical rules for the 600 MHz band that comply with the Spectrum Act's clear mandate for licensed interference protection.

⁷ See Comments of the Telecommunications Industry Association, ET Docket No. 14-165, GN Docket No. 12-268, at 8-9 (Feb. 4, 2015) ("TIA February 2014 Comments") (delineating various problems associated with the technical assumptions underlying the Commission's interference calculations); Comments of Qualcomm, Inc., ET Docket No. 14-165, GN Docket No. 12-268, at 5 (Feb. 4, 2015) ("Qualcomm February 2015 Comments") (arguing that the technical assumptions set forth in the *Unlicensed NPRM* are invalid).

⁸ See Comments of Broadcom Corp., ET Docket No. 14-165, GN Docket No. 12-268, at 4-5 (Feb. 4, 2015) ("Broadcom February 2015 Comments"). Broadcom's link loss values appear to assume that LTE and white space devices will be separated by two to three meters, which is inconsistent with the use cases Broadcom asserts will occur. Assuming a more realistic one meter separation distance between licensed and unlicensed devices would lead to less link losses than assumed by Broadcom.

⁹ See CTIA February 2015 Comments, Appendix B at 9-10; Qualcomm February 2015 Comments at 10-11.

¹⁰ CTIA February 2015 Comments, Appendix B at 9-10.

Adopting technical rules that are consistent with the V-COMM study will be key to ensuring that the licensed spectrum is truly fungible. The Commission has emphasized that it will “ensure that the spectrum blocks are as interchangeable as possible.”¹¹ As the V-COMM results make clear, however, the Commission’s current technical proposals are fundamentally at odds with this goal. Under the current proposals, large swaths of licensed spectrum would be impaired by harmful interference from unlicensed operations in adjacent blocks. With such impairments, achieving true spectrum fungibility, and full compliance with the Spectrum Act, would be impossible. If the Commission is to achieve its important goal of auctioning fungible blocks of spectrum, it must adopt technical rules based upon the results of the V-COMM study.

To this end, AT&T urges the Commission to adopt more stringent out of band emission (“OOBE”) requirements. The V-COMM study revealed that “OOBE interference, unless sufficiently attenuated,” would limit the capabilities of affected licensed 600 MHz services.¹² Accordingly, OOBE from both unlicensed white space devices and wireless microphones need to be attenuated significantly more than the Commission has proposed.¹³ In particular, to comply with the Spectrum Act’s objectives, an OOBE limit of -89 dBm/100 kHz into 600 MHz downlink spectrum is necessary.¹⁴ Adopting more stringent OOBE requirements is of particular importance to licensed 600 MHz operators as they cannot filter out OOBE given that OOBE

¹¹ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report & Order, GN Docket No. 12-268, ¶ 45 (2014) (“*Incentive Auction Order*”)

¹² CTIA February 2015 Comments at 4.

¹³ Indeed, the Commission’s current technical proposals would permit a significant level of interference, degrading LTE service and impairing coverage as well as performance for all LTE devices in a given area. *See id.* at 14.

¹⁴ CTIA February 2015 Comments at 13.

arise in the same frequency such operators are intending to receive.¹⁵ Without the ability to filter such interference, 600 MHz operators will need to exclusively rely on the Commission's rules for interference protection.¹⁶ As a result, adopting appropriately rigorous OOB requirements will be critical to the ultimate success of the 600 MHz band.

Some commenters have expressed support for the Commission's proposed OOB limits, but this support is premised on Broadcom's flawed technical analysis.¹⁷ Broadcom's analysis suffers from its fatal reliance on 3GPP standard defined values for receiver desensitization instead of measured values.¹⁸ By contrast, the V-COMM study modeled real world interference effects by evaluating the interference susceptibility of LTE devices in light of the devices' desensitization levels.¹⁹ While V-COMM's analysis is based entirely on real world testing, Broadcom's analysis alternates between measured data and standards-derived assumptions. With this selective and unprincipled approach, Broadcom's analysis skews in favor of device performance capabilities that will best suit its interests. The Commission should reject this malleable approach and instead rely upon the consistent and reliable analysis set forth in the V-COMM study to adopt stronger OOB limits.

In addition to adopting more stringent OOB requirements, the Commission should reconsider its duplex gap proposal. As the V-COMM study illustrates, the Commission's

¹⁵ *Id.*

¹⁶ *Id.* at 12-13.

¹⁷ See, e.g., Comments of Google Inc., ET Docket No. 14-165, GN Docket No. 12-268, at 10-12 (Feb. 4, 2015) ("Google February 2015 Comments").

¹⁸ Broadcom February 2015 Comments at 8-9.

¹⁹ See CTIA February 2015 Comments at n.26. The difference in sensitivity values is significant. While the 3GPP sensitivity specification is -97 dBm/5 MHz, V-COMM's average measured sensitivity value was -105.1 dBm/5 MHz. *Id.*, Appendix B at 14.

proposed division of the duplex gap—together with the proposed technical rules for wireless microphones and white space devices—will result in harmful interference to licensed downlink operations in the 600 MHz band.²⁰ If adopted, the Commission’s division of the duplex gap would allow harmful interference from licensed microphones more than 21 meters away from LTE devices. A wireless microphone operating on the opposite side of a basketball court could thus cause harmful interference to a LTE device.²¹ As such, a larger buffer zone—of 5 MHz—will be needed to protect licensed 600 MHz operators from harmful interference in the duplex gap. AT&T supports CTIA’s duplex gap proposal, which would preserve a 5 MHz buffer between a spectrum segment for licensed downlinks and a spectrum segment for white space devices and wireless microphones.²² In line with the Spectrum Act’s mandate, CTIA’s duplex gap proposal (together with reductions in OOB, as noted above) would ensure that unlicensed operations do not cause harmful interference to licensed services.

The V-COMM study results also indicate that the Commission should take additional steps to protect licensed downlinks from harmful interference caused by unlicensed devices in the guard band.²³ In addition to implementing the more rigorous OOB requirements outlined above, the Commission should mandate a 9 MHz buffer between wireless microphones and licensed LTE downlink spectrum.²⁴ Further, with respect to white space devices, the

²⁰ See *id.* at 15-16. Under the Commission’s “1-4-6 Megahertz split” proposal, a one megahertz buffer zone would separate licensed downlinks from a four megahertz segment for licensed microphones. *Unlicensed NPRM* ¶¶ 92, 94.

²¹ CTIA February 2015 Comments at 19.

²² See *id.* at 18-19 (analyzing average interference levels with different buffer sizes).

²³ See *id.* at 20-21.

²⁴ *Id.* at 20.

Commission should require a 5 MHz frequency buffer between white space devices and licensed LTE downlink spectrum, as well as a reduced power limit of 6.6 dBm.²⁵ Without these additional technical protections and frequency buffers, 600 MHz licensed downlink operations will be impaired by harmful interference.

Finally, the Commission should mandate that white space devices operating in the 600 MHz band cease operations in a market once a commercial licensee has initiated service in the market. Permitting white space devices to operate once a commercially licensee begins service in a market would undermine the exclusive rights purchased by licensees at auction. Moreover, allowing such contemporaneous service is inconsistent with the spirit of the Spectrum Act. Although the Spectrum Act contemplates use of guard bands for unlicensed uses, it does nothing to elevate the rights of unlicensed users relative to exclusive use licensees.²⁶ Accordingly, white space devices should not be permitted to continue contemporaneous operations after a commercial licensee has initiated service in a given market.

III. CONCLUSION

AT&T appreciates the opportunity to comment on the complex technical issues raised by allowing unlicensed operations in the repurposed 600 MHz band. For the reasons set forth above, AT&T joins CTIA in urging the Commission to use the V-COMM study as a roadmap in crafting technical rules that will protect licensed operations from harmful interference, in accordance with the Spectrum Act's commands.

²⁵ *Id.*

²⁶ *See* Spectrum Act §§ 6407(c), (e).

Respectfully submitted,

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