Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 2, 22, 24, 27, 90 and	)	WT Docket No. 10-4
95 of the Commission's Rules to Improve	)	
Wireless Coverage Through the Use of Signal	)	
Boosters	)	

REPLY COMMENTS OF WIRELESS EXTENDERS, INC.

Wireless Extenders, Inc. ("Wi-Ex") hereby submits its reply comments to the Commission's Notice of Proposed Rule-Making ("NPRM")[1] in the above-captioned proceeding regarding the use of signal boosters to improve wireless coverage. Wi-Ex focuses its reply comments to consumer boosters for CMRS networks.

Wi-Ex is pleased that the Commission's efforts in soliciting comments for the NPRM has resulted in a wide range of input to ensure that "[t]he public interest is best served by ensuring that consumers have access to well-designed boosters that do not harm wireless networks."[2] The comments filed in response to the NPRM support the Commission's goal of "facilitat[ing] the development and deployment of well-designed signal boosters" and provide a foundation for a solution as envisioned in the NPRM.

As the Commission rightly noted in the NPRM, "[t]he relatively low-cost, coverage enhancing features of signal boosters will . . . help many Americans to enjoy the dynamic growth in the variety and quality of wireless service offerings."[3] To bring the Commission's vision of

[1] *Amendment of Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission's Rules to Improve Wireless Coverage Through the Use of Signal Boosters*, Notice of Proposed Rule-Making , WT Docket No. 10-4, FCC 11-53 (rel. Apr. 6, 2011).
[2] NPRM at 2, ¶ 2.
[3] NPRM at 6, ¶ 11.

ubiquitous mobile voice and broadband across America to fruition, the Commission must rely upon entrepreneurial innovation and appropriate, neutral regulation the foster the continued development and deployment of consumer signal boosters.

Specifically, the Commission should adopt rules which ensure that signal boosters include appropriate interference safeguards and should reject heavy-handed regulation that would give carrier's effective control over devices and forestall the development of a market for consumer-benefiting devices.

I. INTRODUCTION

The commenting parties largely agree that consumer boosters will further the benefits of wireless voice and broadband services for more consumers, and will help extend the reach of existing wireless networks.[4] Many commenting parties, including wireless carriers, agree that signal boosters should be sold as consumer devices.[5] Moreover, commenting parties agree that in order to facilitate a market for consumer devices, the Commission should adopt necessary technical rules designed to ensure that boosters do not pose a risk to wireless carrier networks, but should refrain from adopting needlessly restrictive and intrusive rules that give carriers control over consumer devices.[6] In order to bring about the widest benefit, pragmatic solutions must prevail. In Wi-Ex's experience, if a device costs more than a few hundred dollars, it is no longer a viable option for most consumers. Accordingly, as the Commission considers safeguards needed to protect wireless networks, it should ensure that the rules it adopts preserve a viable market for consumer boosters lest the advantages of signal boosters identified by the

[4] *See, e.g.*, Comments of Public Knowledge and the New America Foundation at 2-3 ("PK/NAF Comments"); Comments of Wilson Electronics, Inc. at 1 ("Wilson Comments"); Comments of Cellphone-Mate, Inc. at 17 ("Cellphone-Mate Comments") .

[5] The Joint Proposal submitted by Verizon Wireless and Wilson Electronics, discussed in greater detail in these reply comments, acknowledges that signal boosters, with appropriate safeguards, can be sold as consumer devices.

[6] *See, e.g.*, Cellphone-Mate Comments at 4-7; PK/NAF Comments at 4.

Commission be effectively unavailable to most consumers.

As it considers the issues raised in this proceeding, the Commission should keep in mind that well-designed signal boosters benefit not only consumers and booster manufacturers, but also wireless carriers themselves. Signal boosters enable higher usage of services and thus increase monthly revenues to carriers, improve signal coverage for frustrated consumers and thus reduce the number of calls to the carrier and the need to switch carriers, reduce the need for network upgrades and optimization, and contribute to more efficient spectrum use.

Finally, Wi-Ex agrees with the commenters that support the Commission's proposed licensing-by-rule framework that authorizes individuals to operate licensee-agnostic consumer signal boosters.[7]

II. THE VERIZON-WILSON-V-COMM PROPOSAL PROVIDES AN EFFECTIVE FOUNDATION ON WHICH TO BUILD COMPREHENSIVE SAFEGUARDS FOR CMRS CARRIER NETWORKS

Wi-Ex applauds Verizon Wireless for taking a bold step towards helping their customers truly "Rule the Air ™" by collaborating with a booster manufacturer and a DAS integrator to prepare a joint proposal for the design and operation of signal boosters ("Joint Proposal"). Importantly, the Joint Proposal effectively differentiates between high-gain, carrier/commercial-grade booster solutions (a.k.a. "CEO boosters") vs. lower-gain, consumer booster solutions, and the absolute necessity for different requirements for these categories of boosters. It is in this differentiation that unlocks a fundamental key attribute of a consumer booster, namely a wideband, multi-carrier frequency response. In addition, while these two important categories are created, carriers maintain the freedom and flexibility to approve any other solution which

[7] NPRM at 2, ¶ 3; Wilson Comments at 3-8; PK/NAF Comments at 4-7.

meets their specific requirements. Wi-Ex thanks Verizon, Wilson, and V-COMM for their willingness to offer a substantive proposal for public comment.

The Joint Proposal begins the process of developing a set of safeguards which virtually eliminates the opportunities of interference to carrier networks while making acceptable compromises to achieve the Commission's necessary objective of providing consumers with an affordable solution. Wi-Ex and Wilson Electronics have demonstrated a deep understanding of signal booster systems, a respect for licensee's needs, and a commitment to implement effective techniques of interference prevention and protection in order to serve consumers with the signals they deserve. Wi-Ex is convinced that workable solutions and compromises can be found which will result in a "win" for all parties involved. The Joint Proposal contains many safeguards which are very similar to techniques that Wi-Ex currently employs. Insofar as Wi-Ex correctly interprets these safeguards, we find many of them acceptable. There are limits described below that we believe are necessary to adjust. Finally, there are also several provisions which we believe would have the effect of nullifying the Commissions intent for the NPRM. We remain confident, however, that further dialogue and collaboration can yield acceptable compromises and pragmatic solutions and Wi-Ex would like to be a constructive force in these dialogues.

A. Properly Designed Safeguards and Testing Prior to Sale Can Ensure No Risk to Carrier Networks, Making Registration and Coordination Unnecessary

Wi-Ex believes that the registration and coordination of frequency and power for consumer signal boosters is, first and foremost, not necessary, especially when appropriate technical safeguards can ensure that boosters pose minimal interference risk to wireless carrier networks. Registration and coordination schemes that place the burden upon consumers are likely to be confusing and unworkable and may nullify the benefits of consumer-oriented devices

sought in the NPRM. Furthermore, requiring the booster devices themselves to include automatic registration and coordination capabilities is likely to raise their cost dramatically[8], which in turn would effectively minimize the distribution of signal boosters and the resultant benefit to consumers. Furthermore, given the implementation challenges and the technical safeguards already in place, Wi-Ex strongly suspects that registration of consumer boosters would not practically accomplish the intended function — to significantly alleviate the burden arising from interfering boosters — particularly when the resulting database will include only the newer boosters with more stringent technical safeguards and not the approximately one million or more existing boosters that are significantly more likely to be the cause of interference.

The Joint Proposal has clearly expressed that the causes of potential interference raised in the making of the NPRM have been addressed. With some fine tuning, a comprehensive set of safeguards will be in place such that a set of certification rules will allow booster products to be effectively tested to insure that new, compliant boosters will not add interference. Even assuming that the resulting rules and test procedures may need improvement over time, the present incidences of interference will significantly diminish as the number of non-compliant and interfering boosters (a subset of all installed units) are upgraded, obsoleted due to network enhancements, and otherwise removed from service. Therefore, current resources required to track down poorly designed boosters will also decline implying that a registration system is of little value.

Though the Joint Proposal includes a registration requirement that would require consumers to contact their CMRS carriers to register signal boosters, it does not provide sufficient detail as to how such a registration system would work. Would there by a streamlined

[8] Based upon quotes for Bluetooth and GPS modules in 100,000 piece volumes, we estimate that the consumer cost of a Wi-Ex product would increase by at least $32.70 and $45.40, respectively, but with no increase in consumer benefit.

process, such as a single clearinghouse, for registration, or would consumers have to deal with unknowledgeable customer service representatives? How would households with subscriptions from multiple wireless carriers register their devices? More details are needed before the Commission can decide whether such a requirement would be workable and not simply serve as a deterrent to consumers in much the same way CableCARD installation has proven to be a challenge for consumers seeking to use competitive set-top boxes with their cable subscriptions.

The Joint Proposal must also address the planned usage of the information gathered during registration to ensure it meets the stated goal of resolving interference. For example, how would field personnel use the information provided by consumers? More information on how the carriers would use the information provided via registration could help Wi-Ex and other interested parties to address wireless carrier concerns regarding potential interference and mitigation approaches.

B. General Comments and Request for More Discussion of Intended Limits

The Joint Proposal, while comprehensive, provides little by way of explanation for the conclusions it reaches. In general, Wi-Ex would like to see more details for why the specific levels were chosen. While Wi-Ex agrees with the principal reasons, we feel that nearly all of the limits were derived assuming multiple worst case factors would combine in a "worst, worst case scenario." Certainly, we could agree that in some instances, this is the appropriate method, but not for all limits. Wi-Ex believes that efforts to over-regulate or overlap requirements with excessive limits will ultimately limit innovations that will provide even greater effectiveness.

Specifically, why was each gain limit selected for differing mobile boosters? For example, it is unnecessary to require that a "direct connect" or cradled booster have low gain since the output power limit will already govern this. If a "direct connect" or cradled booster has excessive gain, it

will constantly shut-off due to UL overload or be damaged from excessive input power. A similar argument can be made to exclude a regulation for gain balance. Excessive imbalance only hurts the purchaser by dropping calls. The CMRS network will be protected already by the UL noise and power control regulations.

C. Output Power Level Limits

Wi-Ex agrees that a downlink power limit of 50mW is appropriate. In the uplink, 1 Watt is adequate for urban users and the newer frequency bands which only use wideband signals; however, rural and remote locations still served by GSM (2G) equipment could benefit from higher power levels which are available from GSM phones. Wi-Ex suggests that the 1 Watt limit from the booster is appropriate, but that an EiRP limit of 3 Watts should be allowable in the 850MHz cellular band and 2 Watts in the 1900MHz PCS band.

D. Wideband Signal Requirement: PAPR (Peak to Average Power Ratio)

While PAPR is an important factor in wideband signals, it is not necessary, for several reasons, to add it to the list of regulations and testing requirements. First, a minimum effective headroom of booster amplifiers is already governed through other requirements, namely ACPR (adjacent channel power ratio) and IMD3 (3^{rd} order Intermodulation Distortion). Second, PAPR need not be specified since market forces will favor higher quality products. Good boosters will maximize the signal quality and be marketed as such. Devices with minimally sufficient PAPR to meet ACPR and IMD3 will yield a lower quality signal for the purchaser and may not provide customers with the experience that they expect and which caused them to purchase a booster in the first place. The effect upon CMRS Networks will still be a net positive since, before a

booster is installed, the network is already handling the weak, low-quality signal with techniques such as adaptive coding.

E. Spurious OOBE Limits

The Joint Proposal recommends that all OOBE limits should be 6dB lower than the current FCC limit of -13dBm in order to avoid a "worst, worst-case" scenario of a MS spurious lining-up with a nearly identical Booster spurious signal and thus allowing a potential maximum net spurious output of +3dB or -10dBm. Wi-Ex is willing to accept this limit with the exception of IMD3 in the uplink. IMD3 emissions are not relevant for MS UL, since a MS only outputs a single channel. Therefore, the current FCC requirement of -13dBm for UL IMD3 is sufficient.

F. Permissible Oscillation Duration

Wi-Ex proposes using a factor which accounts for oscillation power as well as duration to achieve a better outcome for reduced interference. A 1W booster meeting the necessary linearity requirements to meet the IMD3 requirement of -13dBm would have an OIP3~=52dBm and could generate a saturated output power during oscillation of 20Watts. Using the 0.3 second time limit in the Joint Proposal, the Power * Time factor would be 20W * 0.3sec = 6.0 W-sec. We propose a more stringent factor of 1.0 W-sec. to better limit the total scope of interference due to an oscillation event.

G. Uplink Gain and Noise Control

The descriptions about UL Gain and Noise control need additional clarification. They seem to provide proper protection measures, but Wi-Ex is concerned that they may be too restrictive. These measures do, however, effectively limit the UL output power for both near and

far base stations, which addresses the important concern raised by True Position, Inc. for the potential of a positioning receiver being overloaded.[9]

H. Labeling

While Wi-Ex agrees that consumers may need help following some of the key installation requirements, we are very concerned that the language must be clear and non-threatening. For example, some information may need to be provided pertaining to E-911, but it should be done so in a manner consistent with the current practices used with mobile handsets. The language in the Joint Proposal is not clear and is only written to pertain to GPS-based location services.

III. THE COMMISSION SHOULD ALLOW BOOSTERS ALREADY IN USE TO CONTINUE BEING USED

Wi-Ex agrees with those parties who argue that signal boosters already in use by consumers should be grandfathered rather than being subject to a costly, confusing, and unnecessary recall process.[10] The marketplace has already weeded-out many of the more offensive, poorly made signal boosters. As Wi-Ex has previously stated, the record provided by carriers showed a decrease in interference over time.[11] Over the same time period, the number of boosters sold was on the rise. No new interference data has been given to refute this observation. Therefore, it is reasonable to conclude that the very basic (yet non-standardized) safeguards already implemented (oscillation control, output power control, and tying the UL to detected DL levels) are dramatically reducing interference to CMRS networks and inconvenience to the

[9] TruePosition, Inc. Comments at 3-5.
[10] Wilson Comments at 8-9, Cellphone-Mate Comments at 16-17, Comments of T-Mobile USA, Inc. at 14.
[11] Reply Comments of Wireless Extenders, Inc, WT Docket No. 10-4, at 7-9 (filed Mar. 8, 2010).

carriers. Moreover, signal booster manufacturers will have every incentive to market and sell new devices to consumers that replace the older boosters already in the field.

IV. CONCLUSION

Wi-Ex supports the Commission's goal of a regulatory framework that promotes the use of signal boosters by consumers to enhance wireless coverage. In doing so, the Commission should not adopt regulations, such as requiring prior approval or coordination from wireless carriers that keep signal boosters from being effective as consumer solutions. The Joint Proposal from Verizon Wireless and Wilson Electronics represents a significant foundation toward a solution that protects wireless carrier networks while facilitating the sale, use, and deployment of consumer signal boosters. Wi-Ex looks forward to working with the Commission staff and interested parties to refine the Joint Proposal and help resolve remaining issues and concerns.

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Respectfully submitted,

WIRELESS EXTENDERS, INC.

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Date: August 24, 2011