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

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

COMMENTS OF CTIA – THE WIRELESS ASSOCIATION®

Michael F. Altschul
Senior Vice President and General Counsel

Christopher Guttman-McCabe
Vice President, Regulatory Affairs

Brian M. Josef
Assistant Vice President, Regulatory Affairs

CTIA-The Wireless Association®
1400 Sixteenth Street, NW
Suite 600
Washington, DC 20036
(202) 785-0081

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CTIA – The Wireless Association® ("CTIA") respectfully submits these comments in response to the Federal Communications Commission's ("FCC" or "Commission") Notice of Proposed Rulemaking ("NPRM") proposing to amend Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission's rules to adopt new technical, operational, and coordination parameters for fixed and mobile signal boosters.[1] CTIA welcomes the opportunity to help inform the Commission's determination regarding the proper treatment of unauthorized signal boosters. The ongoing illicit use of signal boosters can cause serious disruption to wireless networks and interfere with vital Public Safety communications. CTIA urges the Commission to take action to eliminate signal boosters' interference to wireless networks.

[1] The FCC's Notice of Proposed Rulemaking defines the term "signal booster" as "intended to include all manner of amplifiers, repeaters, boosters, distributed antenna systems, and in-building radiation systems that serve to amplify signals for subscriber-based services between a device and the network," excluding femtocells. 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 Rulemaking, 26 FCC Rcd 5490 at n. 14 (Apr. 6, 2011) ("NPRM"). In these Comments, CTIA utilizes the Commission's definition of "signal booster."

I. INTRODUCTION AND SUMMARY

To combat the risk of harmful interference, it is critical that the Commission affirm that a FCC license or licensee consent is required to operate a signal booster. The Commission also must clarify that the sale of boosters to unauthorized parties is illegal. The sale and unauthorized use of these devices will continue to proliferate if the Commission does not affirm and enforce its existing requirements.

The Commission should only adopt technical and design standards for signal boosters that would completely mitigate harmful interference. As described below, CTIA offers suggested features that can eliminate harmful interference. The Commission also should establish an equipment certification process for boosters similar to the process used for wireless devices, and ensure that signal boosters are designed with next generation networks in mind. CTIA hopes that this NPRM will lead to further constructive discussion of the appropriate regulatory and technical standards for signal boosters.[2]

II. THE COMMISSION MUST TAKE ACTION TO CURB THE DAMAGING INTERFERENCE TO WIRELESS NETWORKS CAUSED BY UNAUTHORIZED SIGNAL BOOSTER OPERATION.

As the Commission recognizes, "poorly designed, improperly installed or malfunctioning signal boosters can cause interference to both commercial and public

[2] Earlier in this proceeding, Wilson Electronics, Inc. and Verizon Wireless indicated that they were working together towards a solution to signal booster interference issues that would benefit both booster manufacturers and wireless carriers. *See* Wilson Electronics Inc. and Verizon Wireless, Joint Motion for Extension of Time, WT Docket No. 10-4 (filed June 16, 2011). In granting the requested extension of time to file comments, the Commission noted that the wireless carrier and signal booster manufacturer could "discuss the complex issues at stake and develop consensus approaches that benefit consumers." 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, Order, DA 11-1078 at 1 (rel. June 20, 2011).

safety wireless networks."[3] Signal boosters' disruption of wireless networks continues to occur frequently and, in many cases, is quite severe. The Commission must affirm that a FCC license or licensee consent is necessary before operating a signal booster. Further, the Commission must clarify that the sale of boosters to unauthorized parties is illegal. Action by the Commission on the issue of unlawful operation of signal boosters is urgently needed to protect the integrity of wireless networks and Public Safety communications.

A. The Record Demonstrates that the Ongoing Unauthorized Use of Signal Boosters Has Resulted in Considerable Interference to Wireless Networks and Has Inhibited Public Safety Operations.

The NPRM notes that signal boosters can and do produce "noise" in the form of adjacent channel interference, oscillation, or base station receiver overload.[4] Moreover, signal boosters risk amplifying not only the signals the user intends, but also causing co-channel interference. These types of interference issues degrade network coverage and quality of service. Not only do signal boosters damage wireless networks and degrade service for neighboring users, they also require carriers and Public Safety to divert significant resources toward finding and addressing the source of interference to their networks.

The ongoing illicit use of unauthorized signal boosters has continued to cause significant interference to wireless networks. In response to last year's Public Notice[5] on the use of signal boosters, numerous Public Safety organizations across the country filed

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[3] NPRM at ¶ 14.

[4] *Id*.

[5] Wireless Telecommunications Bureau Seeks Comment on Petitions Regarding the Use of Signal Boosters and Other Signal Amplification Techniques Used With Wireless Services, Public Notice, DA 10-14 at n. 1 (Jan. 6, 2010).

comments describing how they strain under the burden of finding and eliminating signal booster interference on their networks.[6] Many of the comments described expending limited department time and resources trying to locate the offending signal booster.[7] In addition, multiple wireless service providers detailed examples of ongoing interference across their networks.[8] These incidents represent only those capable of being documented—it is impossible to know how many "fleeting" disruptions have been caused by signal boosters. Moreover, one cannot ignore the negative impact that signal boosters can have on the effectiveness of E911 location accuracy for wireless subscribers. Signal boosters have the potential to create inaccurate location estimates for the subscriber that purchased the signal booster as well as unintended mobiles in the vicinity of the offending signal booster.

This growing interference problem exacerbates the near-term spectrum crisis faced by wireless operators. Providers' ability to derive full use – and extract the greatest spectral efficiency – from their spectrum resources is diminished when providers are challenged by interference from unauthorized signal boosters. The Commission has made it a priority to address the near-term spectrum crisis,[9] but the unauthorized use of

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6 *See, e.g.*, Comments of the Cobb County E911 Communications Bureau, WT Docket No. 10-4, at 2 (Jan. 15, 2010); Comments of Massachusetts State Police, WT Docket No. 10-4, at 1-2 (filed Feb. 4, 2010); Comments of the County of San Bernardino County Information Services Department Telecommunications Services Division, WT Docket No. 10-4, at 1 (Feb. 5, 2010).

7 *See, e.g.*, Comments of St. Lucie County, Florida Public Safety Department, WT Docket No. 10-4, at 1 (Jan. 20, 2010).

8 Comments of United States Cellular Corporation, WT Docket No. 10-4, at 5-6 (Feb. 4, 2010); Comments of AT&T Inc., WT Docket No. 10-4, at 30-31 (Feb. 5, 2010) ("AT&T Comments"); Comments of Verizon Wireless, WT Docket No. 10-4, at 5-6 (Feb. 4, 2010) ("Verizon Wireless Comments").

9 *See generally* Julius Genachowski, Chairman, Federal Communications Commission, "The Clock is Ticking," (Mar. 16, 2011), *available at*

signal boosters stands in the way of that goal. For wireless providers to effectively serve consumers in the face of this looming spectrum crisis, they must be able to fully access their licensed spectrum resources free from interference from unauthorized devices operating in these bands. Unfettered access is the only way providers can drive the full use of their spectrum and continue to provide innovative services to their customers.

While the Commission's NPRM seeks comment on how to treat existing signal boosters, suggesting "sunsetting" their use or grandfathering them,[10] the NPRM does not address how to resolve the unauthorized signal booster operation currently taking place. The NPRM will do nothing to curb these frequent and damaging interference events, leaving commercial and Public Safety networks at risk. As the record in this proceeding demonstrates, wireless providers cannot effectively police the evolving interference threats without effective enforcement of the Commission's rules.

B. The Commission Must Affirm that an FCC License or Licensee Consent is Required to Operate a Signal Booster.

CTIA raised concerns about the unauthorized use of signal boosters over three years ago in a Petition for Declaratory Ruling.[11] The Petition for Declaratory Ruling described how the Public Safety community was increasingly relying on commercial

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http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-305225A1.pdf. *See also* Julius Genachowski, Chairman, Federal Communications Commission, "Innovation in a Broadband World," at 8 (Dec. 1, 2009), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-294942A1.pdf ("While invisible, spectrum is the lifeblood of our wireless networks and a critical part of our innovation infrastructure. In recent years, the FCC has authorized a three-fold increase in commercial spectrum. But experts anticipate a 30-fold increase in wireless traffic. Given that spectrum can take many years to reallocate and build out, if we don't start the process now, we'll pay a steep price in innovation down the road.").

[10] NPRM at ¶ 62.

[11] Petition for Declaratory Ruling of CTIA – The Wireless Association®, WT Docket No. 10-4 (Nov. 2, 2007) ("CTIA Petition").

wireless networks to provide critical communications during emergencies, but unfortunately, the reliability of wireless communications was "at risk of being severely undermined by the marketing and use" of signal boosters.[12] In light of this risk, CTIA requested that the Commission issue a declaratory ruling that the unauthorized use of wireless boosters and repeaters is unlawful.[13] In the last three years, the need for Commission action and enforcement has only become more pronounced.

The Commission must affirm and enforce its rules that prohibit the operation of signal boosters without a license or FCC licensee consent. Section 301 of the Communications Act requires all transmitting equipment operating on licensed spectrum to be licensed by the Commission.[14] In implementing Section 301, the Commission developed a CMRS regulatory regime focused on exclusive-use licensing and licensee control. The Commission's rules echo these points:

- Part 1 states that stations in the wireless radio services must be used and operated in accordance with the rules applicable to their service and may not be operated without a valid authorization.[15]

- Part 22 explains that a subscriber's authority to operate a handset on licensed spectrum stems directly from the "authorization held by the licensee providing service to them."[16]

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12 CTIA Petition at 1.

13 CTIA Petition at 2.

14 47 U.S.C. § 301 ("No person shall use or operate any apparatus for the transmission of energy or communications or signals by radio . . . except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act.").

15 47 C.F.R. § 1.903 ("Stations in the Wireless Radio Services must be used and operated only in accordance with the rules applicable to their particular service as set forth in this title and with a valid authorization granted by the Commission under the provisions of this part.").

- Part 22 further provides that "[a] *licensee* may operate additional transmitters at additional locations on the same channel or channel block as its existing system without obtaining prior Commission approval," if certain conditions are met.[17]

- Part 24 contains another similar provision, stating that blanket licenses will be granted, but applications for individual sites will not be accepted.[18]

All of these provisions reinforce the conclusion that "blanket" licensing under these rules does not extend to signal boosters.

Part 22 also requires that licensees control all transmitting devices operating on their networks, including all devices used by end user customers, and prevent interference.[19] Wireless providers cannot meet this requirement amidst the unauthorized operation of signal boosters on their networks. Currently, signal boosters do not allow wireless licensees to maintain operational control over devices, and CTIA is unaware of any device that allows for operational control to be maintained by the wireless licensee for any signal booster. In contrast, mobile devices connected to the wireless network are under the control of the wireless licensee's base station, allowing the licensee to manage any interference effects within the network. These Commission rules make clear that a FCC license or licensee consent is required to operate a signal booster.

Commission precedent consistently has found that signal boosters may only be operated and/or authorized by licensees. In 2005, the Commission took the opportunity

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16 47 C.F.R. § 22.3 ("Stations in the Public Mobile Services must be used and operated only in accordance with the rules in this part and with a valid authorization granted by the FCC under the provisions of this part.").

17 47 C.F.R. § 22.165 (emphasis added).

18 47 C.F.R. § 24.11(b) ("Blanket licenses are granted for each market and frequency block. Applications for individual sites are not required and will not be accepted.").

19 *See* 47 C.F.R. § 22.927.

"to clarify that, under our current policies, [boosters] may only be operated by a licensee or pursuant to the licensee's permission and control, unless they fall under the power limits for unlicensed devices under our Part 15 rules."[20] In adopting open access requirements in the 700 MHz band, the Commission noted that "a provider could exclude devices such as signal boosters and repeaters to the extent they are inconsistent with the technical or operational parameters of the network," further recognizing the need for licensee control of devices operating in their spectrum.[21]

The Commission's enforcement actions show that the unauthorized operation of signal boosters is impermissible under Commission rules. In a Notice of Apparent Liability for Forfeiture against Digital Antenna, Inc. ("Digital Antenna"), the Enforcement Bureau noted that a license or authorization from a licensed provider is required to operate the devices manufactured and marketed by Digital Antenna.[22] And in response to a complaint filed by TX RX Systems, Inc. ("TX RX Systems"), the Division Chief of the Enforcement Bureau's Spectrum Enforcement Division confirmed that "[signal boosters and in-building radiation systems] may only be installed and operated

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[20] *Amendment of Part 22 of the Commission's Rules To Benefit the Consumers of Air-Ground Telecommunications Services*, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 4403, ¶ 133 (2005).

[21] *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Second Report and Order, 22 FCC Rcd 15289, n. 503 (2007) ("*700 MHz Second Report and Order*").

[22] *Digital Antenna, Inc., Sunrise, Florida*, Notice of Apparent Liability for Forfeiture and Order, 23 FCC Rcd 7600, ¶ 7 (2008) ("Irrespective of whether Digital Antenna agrees with the Bureau that either an FCC license or authorization from a licensed cellular or PCS provider is required to operate its devices, it was obligated to respond fully and completely to the Bureau's inquiry."). An attachment to the Wilson Petition claims that this finding "was not intended to be a statement of law." Wilson Petition at 10. Nonetheless, a written Commission order outweighs an informal, oral statement made off the record to an individual party.

by licensees."[23] Further, Enforcement Bureau field offices have issued numerous warnings and notices directed at unauthorized operators of signal boosters.[24]

Further, contrary to its proposed course of action, the Commission does not appear to have the authority to define "signal booster radio service" as a type of "citizens band radio service."[25] Although the Commission has statutory authority to define "citizens band radio service," it may not define the term in a way that conflicts with the Communications Act as a whole. The Commission's definition must be "based on a permissible construction of the statute."[26] On its face, a signal booster radio service is fundamentally different from what Congress envisioned when it granted the Commission the power to authorize the operation of radio stations without individual licenses in the citizens band radio service.[27] When Congress enacted this provision, the FCC had

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[23] Letter from Joseph P. Casey, Division Chief, Spectrum Enforcement Division, Enforcement Bureau to Ronald Jakubowski, Chief Engineer, RF Systems, TX RX Systems, Inc. (June 28 2004), attached to Petition for Rule Making of Bird Technologies Group, WT Docket No. 10-4 (Aug. 18, 2005) ("Bird Technologies Petition").

[24] *See, e.g.*, Notice of Unlicensed Operation, Case No. EB-08-NF-0029 (Aug. 20, 2008) (stating that "[o]peration of radio transmitting equipment without a valid FCC authorization or license is a violation of Section 301 of the Communications Act of 1934, as amended"); Notice of Unlicensed Operation, Case No. EB-08-LA-0295 (Oct. 24, 2008) (same); Notice of Unlicensed Operation, Case No. EB-09-MA-0195 (Dec. 3, 2009) (same, and noting that "unlicensed operation creates a danger of interference to important radio communications services"); Warning Notice, Case No. EB-08-MA-0201 (Nov. 17, 2008) (same); Warning Notice, Case No. EB-08-MA-0198 (Nov. 20, 2008) (same).

[25] NPRM at ¶¶ 29-32.

[26] *Chevron USA, Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837, 843 (1984); *see Nat'l Treasury Employees Union v. Chertoff*, 452 F.3d 839, 856 (D.C. Cir. 2006) ("*Chevron* requires a reviewing court to ask whether an agency's *specific course of action* is permitted by statute. It is possible that a statute might grant an agency authority to act in some fashion, but not in the particular manner it has chosen." (quotation marks and alteration omitted)).

[27] *See* Communications Amendments Act of 1982, Pub. L. No. 97-259, § 113, 96 Stat. 1087, 1093 (codified as amended at 47 U.S.C. § 307(e)).

already extensively defined and regulated the citizens band radio service.[28] The citizens band radio service was "a private, two-way, short-distance voice communications service for personal or business activities;"[29] it operated on forty channels in the 26.96-27.41 MHz band;[30] and it authorized licensees to, among other things, discuss personal or business activities, report emergencies, and seek traveler assistance.[31] In short, the citizens band radio service was an identified, specific service with an established meaning. Congress legislated against this backdrop,[32] and its use of the term must be understood in this context.[33]

Indeed, if Congress intended "citizens band radio service" to simply mean "any spectrum designated by the Commission for unlicensed operator use," Congress would not have needed to explicitly authorize the Commission to waive the individual licensing

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28 *See* 47 C.F.R. § 95.401 (1981).

29 *Id.* (CB Rule 1).

30 *Id.* (CB Rule 17); *id*. § 95.603.

31 *Id.* § 95.401 (CB Rule 22).

32 Congress enacted the citizens band provision in order to ameliorate a particular licensing problem related to the growth of CB radio usage in the 1970s. *See* H.R. Rep. No. 97-765, at 36 (1982) ("[T]he cost of processing and granting the millions of [CB and RC] license applications in these services has been substantial. Thus, this provision will produce significant savings without impairing important regulatory interests. Moreover, of the estimated twenty million operators in the CB service, some eight million are estimated to be operating without a license. This situation could create a regulatory nightmare for the Commission if serious attempts were made to remedy this situation.").

33 *See, e.g., Nat'l Treasury Employees Union*, 452 F.3d at 861 ("If . . . 'collective bargaining' in the HSA derives its meaning from the same term in the FSLMRA, then application of the term under the latter statute must guide our understanding of how the term applies under the former. We cannot assume that Congress deployed a term of art, with a long history of legal usage, while contemplating that DHS could completely drain that term of significance.").

requirements for other radio services, as it did in Section 307.[34] Congress's decision to specifically empower the Commission to waive licensing in these other bands clearly demonstrates that each service has a distinct meaning. While the Commission has broad latitude to interpret the provisions of the Communications Act, it cannot do so in a way that renders provisions of the Act "inoperative or superfluous, void or insignificant."[35]

Moreover, contrary to the Commission's suggestion,[36] the record in this proceeding does not support grandfathering existing unauthorized signal boosters. As explained above, the record conclusively demonstrates the considerable harm that unauthorized signal boosters cause: they significantly degrade the service of carriers, consumers, and Public Safety officials. *See supra* Section II.A. Indeed, the NPRM itself concedes these significant problems.[37] Thus, even in the view of the FCC, substantial technical safeguards are a necessary condition precedent before one could even contemplate the proper operation of signal boosters in licensed spectrum. There is no persuasive evidence that existing unauthorized signal boosters have the technical capability to operate safely, and no reason in the record to ignore the serious problems that even the Commission has conceded exist. As a result, any decision to grandfather

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[34] *See* 47 U.S.C. § 307(e)(1) ("[T]he Commission may by rule authorize the operation of radio stations without individual licenses in the following radio services: (A) the citizens band radio service; (B) the radio control service; (C) the aviation radio service . . . ; and (D) the maritime radio service . . .").

[35] *Laurel Baye Healthcare of Lake Lanier v. N.L.R.B.*, 564 F.3d 469, 472 (D.C. Cir. 2009).

[36] NPRM at ¶ 62.

[37] *See, e.g.*, NPRM at 6-7, ¶ 13 ("Malfunctioning, improperly installed, or technically deficient signal boosters . . . may cause harmful interference to commercial and public safety wireless networks . . . . The record before us reflects that wireless service providers and public safety communications officials often spend many hours and significant resources to locate and eliminate signal booster related interference.").

these devices would be arbitrary and unsupported by the evidence.[38]

C. The Commission Must Clarify that the Sale of Signal Boosters to Unauthorized Parties is Illegal.

The Commission must act to prevent harmful interference to wireless carriers and Public Safety by halting the proliferation of unauthorized signal boosters at the source: the point of sale. The Commission should clarify that the sale and marketing of signal boosters to consumers not authorized to use them is a violation of the Communications Act. The sale and marketing of signal boosters that violate licensing and interference control rules promulgated under Section 302(a) of the Communications Act contravenes Section 302(b).

Section 302(a) empowers the Commission to "make reasonable regulations . . . governing the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications."[39] Section 302(b) provides in part that "[n]o person shall manufacture, import, *sell, offer for sale*, or ship devices or home electronic equipment and systems . . . which fail to comply with regulations promulgated pursuant to this section."[40] The Commission has implemented Section 302 by adopting interference control regulations. Thus, the Communications Act

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38 *See PPL Wallingford Energy LLC v. FERC*, 419 F.3d 1194, 1198 (D.C. Cir. 2005) ("To survive review under the 'arbitrary and capricious' standard, an agency must examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." (quotation marks omitted)).

39 47 U.S.C. § 302(a).

40 47 U.S.C. § 302(b) (emphasis added).

enables the Commission to prohibit the sale and marketing of signal boosters that are capable of causing harmful interference to licensed wireless operations.

As described above, the Commission has adopted rules that give a CMRS licensee exclusive use of its licensed frequencies, make a CMRS provider the licensee of all transmitting devices on its spectrum, and require a CMRS licensee to maintain control over devices operating on its spectrum. These rules were developed specifically in response to the directives of Sections 302(a) and 302(b) to prevent harmful interference to wireless licensees. The Commission should affirm these requirements by prohibiting the sale and marketing of signal boosters before interference issues proliferate further. The Commission previously relied on Section 302(b) to prohibit the marketing and sale of unauthorized wireless microphones in the White Spaces proceeding,[41] and absent similar Commission action here, the unlawful sale and use of unauthorized signal boosters will continue to grow.

Manufacturers of boosters market and sell these products as if these regulations do not exist. The record provides ample evidence that manufacturers market and sell devices with knowledge that they do not comply with FCC rules, and knowingly misrepresent to customers that these devices may legally be operated on exclusive use spectrum without licensee authorization.[42] These manufacturers have no motivation to modify these behaviors absent Commission action. Clarifying that the sale of signal

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[41] *Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 25 FCC Rcd 643, 672 (2010).

[42] *See, e.g.*, AT&T Comments at 20-24; Comments of CTIA—The Wireless Association®, WT Docket No. 10-4, at 19-21 (Feb. 5, 2010).

boosters to unauthorized parties is illegal is necessary to prevent continued escalation of illicit sales and operation of these devices.

III. THE COMMISSION SHOULD ONLY ADOPT TECHNICAL AND DESIGN STANDARDS FOR SIGNAL BOOSTERS THAT WOULD COMPLETELY MITIGATE HARMFUL INTERFERENCE

The above discussion illuminates how signal boosters threaten the operation of wireless networks. Past Commission action has recognized these concerns, *see supra* 7-9, and any future Commission action should not deviate from this precedent. While CTIA supports efforts to adopt minimum technical standards for signal booster operations, signal boosters could still cause harmful interference to commercial and Public Safety wireless networks even in an environment requiring carrier consent. To best protect consumers from interference, the Commission only should adopt technical and design standards that fully address the risk of harmful interference.

The NPRM sought to incentivize wireless carriers and signal booster manufacturers to work collaboratively on solutions that would permit deployment of robust signal boosters that do not harm wireless networks and serve the public interest.[43] CTIA likewise supports continuing discussions between signal booster manufacturers and wireless licensees to develop technical and design features that safeguard against harmful interference. The wireless industry and booster manufacturers have indicated they are prepared to work together on these issues to reach the best solution for consumers. The Commission should continue to encourage the industry to determine which features would best protect licensees from the interference caused by signal boosters.

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[43] NPRM at ¶ 2.

A. CTIA Recommends Requiring Features That, While Not Exhaustive, Would Mitigate Harmful Interference.

CTIA proposes a number of features and considerations that may help diminish the risk of interference. This list of features is not exhaustive and further study may lead CTIA to supplement this list with other proposed design features in the future.

As an initial matter, signal boosters must be designed such that the wireless licensee on whose network a booster is operated has ultimate control over the device. The only way for a licensed network to be fully protected against interference is for the licensee to continually monitor the network for interference threats and ensure that spectrum is being used efficiently and effectively. If a device cannot be monitored by the licensee, its design parameters are immaterial. In addition, the signal booster must incorporate technology that allows the wireless licensee to locate the device at all times. This capability would help mitigate interference events that are exacerbated by the wireless provider or Public Safety organization's inability to locate the source of the interference.

In addition, signal boosters must transmit only on the frequencies authorized for use by the wireless provider whose signal is being boosted, rather than across a range of frequencies. The record has shown that broadband signal boosters can seriously damage CMRS and Public Safety networks, and in some cases harmful interference on one carrier's networks is caused by signal boosters installed by customers of other carriers.[44] The Commission should resolve this problem by limiting signal boosters to operating on the frequencies authorized for use by the wireless carrier whose signal is being boosted.

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[44] *See, e.g.*, Verizon Wireless Comments at 6.

Signal boosters also must be designed to include automatic gain control. Automatic gain control would allow the signal booster to sense the power of a local base station and modify the booster's gain accordingly. In contrast to the proposal made by the Commission to limit this feature to just monitoring the power of the base station with which it is communicating,[45] all base stations must be monitored by a booster device. Indeed, many of the interference events caused by boosters are caused by boosters that overpower *other* wireless provider base stations. Therefore, it is absolutely critical to ensure that boosters monitor the power levels of all base stations and automatically modify the gain to protect the operations of wireless carriers. If the received signal level from the base station was powerful enough, the signal booster could potentially even be turned off. Automatic gain control would serve as an important safeguard against harmful interference.

CTIA agrees with the FCC's approach in the NPRM to distinguish between requirements for fixed and mobile signal boosters in light of the device's unique qualities.[46] Fixed signal boosters should contain certain specific features to mitigate the risk of interference, including a GPS chipset that provides the coordinates of the installation location, a remote shut-off control that would allow carriers to shut down a malfunctioning booster, and a mechanism for relaying accurate E911 location information. A fixed signal booster also should operate on a channelized or narrowband basis rather than on a broadband basis across multiple frequencies.

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45 *See* NPRM at ¶ 53.

46 *See* NPRM at ¶¶ 18-19.

For mobile signal boosters, minimum standards should include requirements that mobile boosters contain a remote shut-off function, operate on a channelized or narrowband basis, contain oscillation detection with automatic shut-down, contain components that manage the device's power based on proximity to a base station, and feature a mechanism for relaying accurate E911 location information. The NPRM proposes requiring a signal booster operating in a mobile environment to power down or shut down as the device approaches the base station with which it is communicating.[47] CTIA supports requiring this feature, but suggests that the device must be required to power down or shut down as it approaches *any* base station, as noted above. The NPRM's current proposal would not protect base stations receiving interference from a booster device that is not communicating with the base station.

B. Signal Boosters Should be Subject to an Equipment Certification Process.

In addition to the technical standards outlined above, CTIA supports the establishment of an equipment certification process for boosters conducted by a reliable third party. This certification requirement could track the multi-step certification processes currently used for wireless devices. For wireless devices, a manufacturer first must obtain equipment-certification from the FCC or a Telecommunication Certification Body, and then pass an industry-driven certification process. Last, wireless device manufacturers must receive an approval from the individual spectrum licensee that the device is in compliance with the licensee's network protocols. A multi-step certification process would ensure that the Commission, signal booster manufacturers, and wireless licensees are in agreement on the proper technical specifications for a new device.

[47] NPRM at ¶¶ 53-54.

C. Signal Boosters Must be Designed with Next Generation Networks in Mind.

Next generation wireless systems bring additional complexity to the issue of signal booster design. LTE and WiMax are both based on Orthogonal Frequency-Division Multiplexing ("OFDM") modulation, which requires very high peak to average power ratios to operate efficiently. Accordingly, it is critical that when a booster amplifies an LTE or WiMAX signal, it maintains the linearity of the amplifier operation. CTIA stresses that signal boosters must be designed with next generation networks in mind. For example, if a signal booster is only designed with CDMA specifications in mind, the net effect on an LTE output would be a loss of nearly 50 percent of the peak data rate/spectral efficiency.[48] Therefore to avoid deleterious effects to the performance of consumer devices and wireless network capacity, signal boosters must be designed to account for the existence of next generation networks.

IV. CONCLUSION

For the foregoing reasons, the Commission should continue to take action to prevent harmful interference caused by unauthorized use of signal boosters. The Commission should also encourage a collaborative effort between signal booster manufacturers and wireless licensees to develop technical and design features that

[48] *See* Letter from Brian M. Josef, CTIA, to Marlene H. Dortch, FCC, at 4-5 (filed June 3, 2010).

mitigate the risk of harmful interference and adopt the proposals advanced by CTIA herein.

Respectfully submitted,

By: */s/ Brian M. Josef*

Brian M. Josef
Assistant Vice President, Regulatory Affairs

Michael F. Altschul
Senior Vice President and General Counsel

Christopher Guttman-McCabe
Vice President, Regulatory Affairs

CTIA-The Wireless Association®
1400 Sixteenth Street, NW, Suite 600
Washington, DC 20036
(202) 785-0081

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