VIA ELECTRONIC FILING

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

November 14, 2013

Re: ***Ex Parte Communication – Technical Requirements Governing Signal Boosters Operating in the 700 MHz Public Safety Narrowband Spectrum***

PS Docket No. 13-87
WT Docket No. 96-86
RM-11433
PS Docket No. 06-229
RM-11577

Dear Ms. Dortch:

Axell Wireless submits this letter to supplement the record in the above-referenced proceeding regarding the 700 MHz public safety narrowband spectrum (769-775/799-805 MHz). As part of that proceeding, the Commission seeks comment on rules that it asserts governs adjacent channel power ("ACP") limits from signal boosters operating in the 700 MHz public safety narrowband spectrum. The Commission's request for comments does not take into consideration its recent re-regulation of signal boosters. Even if they ever did, the general technical requirements governing 700 MHz narrowband transmitters contained in Section 90.543 of the rules do not now apply to signal boosters.[1/]

The FCC's establishment of comprehensive rules specific to signal boosters – including the technical requirements in Section 90.219 – superseded the general technical rules which were *not* specific to signal boosters in Section 90.543. The Commission's specific technical requirements in Section 90.219 provide an effective, thoroughly-considered regulatory framework for signal boosters, which, among other things, effectively mitigate any interference concerns.

1/ Axell notes that the Commission recently made changes to Section 90.543 – and particularly Section 90.543(e) – as it applies to transmitters operating in the 700 MHz wideband public safety channels. *See Implementing Public Safety Broadband Provisions of the Middle Class Tax Relief and Job Creation Act of 2012, et al.*, Second Report and Order, PS Docket No. 12-94, *et al.*, FCC 13-137, ¶¶ 19-26 (rel. Oct. 28, 2013) ("*FirstNet R&O*"). The Commission appropriately did not consider applying Section 90.543(e) to signal boosters in the *FirstNet R&O* and should not apply Section 90.543(a) to signal boosters here.

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If the Commission nonetheless determines that signal boosters operating in the 700 MHz public safety narrowband spectrum constitute "transmitters" subject to Section 90.543, it should exempt Class B and Class A signal boosters from the ACP requirements in Section 90.543(a) because it would be practically impossible or economically and technically burdensome for Class B and Class A signal boosters to comply with those requirements.[2/] Imposition of the ACP limits in Section 90.543(a) would hinder critical public safety operations relying on the use of signal boosters in the 700 MHz band, in contravention of the public interest.

Consequently, the FCC should clarify in this proceeding that signal boosters operating in the 700 MHz public safety narrowband spectrum are governed solely by the specific rules in Section 90.219. If it does not reach that conclusion, the Commission should exempt Class B and Class A signal boosters from Section 90.543(a)'s ACP requirements.

BACKGROUND

In June 2008, Axell Wireless' predecessor, Dekolink,[3/] raised concerns with Commission staff that signal boosters on the market may have been operating out of compliance with the ACP requirements in Section 90.543(a) under certain conditions.[4/] In particular, Dekolink suggested that Class B signal boosters authorized to operate in the 700 MHz public safety narrowband spectrum typically produce intermodulation products in excess of ACP limits when simultaneously transmitting two or more signals.[5/] As a result, Dekolink requested that the Commission exempt signal boosters transmitting multiple signals from the ACP requirements of Section 90.543(a).[6/]

2/ The *700 MHz Narrowband R&O and NPRM* asks only about exempting Class B wideband signal boosters from Section 90.543. *See Proposed Amendments to the Service Rules Governing Public Safety Narrowband Operations in the 769-775/799-805 MHz Bands, et al.*, Seventh Report and Order and Notice of Proposed Rulemaking, 28 FCC Rcd 4783, ¶¶ 133-34 (2013) ("*700 MHz Narrowband R&O and NPRM*"). However, both Class A and Class B signal boosters are affected by the regulation. Class A signal boosters can still transmit multiple channels under certain circumstances, creating the same inability to comply with Section 90.543 as Class B wideband signal boosters.

3/ On January 26, 2009, Axell Wireless announced the acquisition of the assets, technology, intellectual property, and products of Dekolink. *See* Press Release, "Axell Wireless Acquires Dekolink Products, Assets & Technology," Jan. 26, 2009, http://axellwireless.com/press-and-events/press-releases/axell-wireless-acquires-dekolink-products-assets-technology/.

4/ *See 700 MHz Narrowband R&O and NPRM* ¶¶ 130-31; Dekolink Slide Presentation, PS Docket No. 13-87 (filed June 18, 2008) ("Dekolink Presentation").

5/ *Id.*

6/ Dekolink Presentation at 8, 13-14; *700 MHz Narrowband R&O and NPRM* ¶ 132.

On February 20, 2013, the FCC released a comprehensive order establishing a "new regulatory framework for signal boosters."[7/] In addition to establishing regulations governing consumer and industrial signal boosters, the Commission also thoroughly addressed and revised technical and operational requirements for Private Land Mobile Radio ("PLMR") industrial signal boosters licensed under Part 90 of the Commission's rules.[8/] The Commission found that it needed to separately evaluate and "adopt separate, specific rules for PLMR signal boosters in Part 90," due to the "technical and regulatory differences" between PLMR signal boosters and other industrial and consumer signal boosters.[9/] Among other things, the Commission in its detailed consideration of the requirements applicable to PLMR signal boosters adopted a registration requirement for Class B signal booster installations, prohibited mobile deployment of Class B (wideband) signal boosters while allowing fixed deployment, required system integrators and installers to consider the potential adverse effects of the increased noise floor on PLMR systems, established additional emission limits to reduce the interference potential of signal boosters, updated the Commission's signal booster equipment authorization process, established label requirements, and clarified certain definitions and power limits applicable to signal boosters.[10/] These rules were adopted based on a fully developed record that specifically addressed signal booster operations.[11/] The rules governing PLMR stations did not distinguish between signal boosters in different frequency bands.

About a month after the Commission released the *Signal Booster Order*, it issued the *700 MHz Narrowband R&O and NPRM* implementing and proposing certain changes to the rules governing the 700 MHz public safety narrowband spectrum. Even though the FCC thoroughly examined, and modified as necessary, its Part 90 rules applicable to signal boosters in the *Signal Booster Order*, the *700 MHz Narrowband R&O and NPRM* sought comment on Dekolink's June 2008 proposal regarding the applicability of Section 90.543's transmitter requirements on signal booster operations.

DISCUSSION

I. The Commission Never Intended for the General Requirements Governing Transmitters in Section 90.543 to Apply to Signal Boosters.

As an initial matter, there is no basis for the Commission to apply Section 90.543 to signal boosters. The plain wording of the regulation supports this view. Section 90.543 does not mention signal

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7/ *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*, Report and Order, 28 FCC Rcd 1663, ¶ 2 (2013) ("*Signal Booster Order*").

8/ *Id.* ¶¶ 5, 144-197.

9/ *Id.* ¶ 145.

10/ *Id.* ¶¶ 144-197.

11/ *Id.* at Appendix D (List of Commenters).

boosters.[12/] If the FCC intended to apply Section 90.543 to signal boosters, it would have included specific reference to them as it did elsewhere in its Part 90 rules.[13/]

Section 90.543(a), which sets forth the ACP limits applicable to transmitters operating in the 700 MHz public safety narrowband spectrum, specifies *mobile* and *base station* transmitters only.[14/] There is no corresponding chart for signal boosters.[15/] Nor should the rules for base or mobile stations be read to apply to signal boosters. A "base station" is defined as a "station at a specified site authorized to communicate with mobile stations,"[16/] and a "mobile station" is defined as a "station in the mobile service intended to be used while in motion or during halts at unspecified points . . ."[17/] Section 90.7 of the rules, as in effect prior to the consolidation of the PLMR signal booster rules in Section 90.219, recognized that a signal booster was neither a base or portable transmitter, providing that a signal booster "retransmits on a one-way or two-way basis, the signals received from base, fixed, mobile, and portable stations . . ."[18/] Today, a "signal booster" is separately defined in Section 90.219 as a "device or system that automatically receives, amplifies, and retransmits signals from wireless stations into and out of building interiors, tunnels, shielded outdoor areas and other locations where these signals would otherwise be too weak for reliable communications . . ."[19/] These separate definitions mean that the Commission always intended to apply different regulatory obligations to each. There is no basis to infer that regulations governing base or mobile stations also apply to signal boosters. If the Commission wanted Section 90.543 to apply to "signal boosters," it would have separately established regulations applicable to them.[20/]

In fact, the Commission recently examined and modified Section 90.543 as it applies to transmitters operating in the 700 MHz wideband public safety channels and did not suggest that those rules

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12/ *See* 47 C.F.R. § 90.543.

13/ *See, e.g.*, 47 C.F.R. § 90.203 (expressly subjecting signal boosters to equipment certification requirements).

14/ *Id.* § 90.543(a).

15/ *See id.*

16/ *Id.* § 90.7.

17/ *Id.*

18/ 47 C.F.R. § 90.7 (2012).

19/ 47 C.F.R. § 90.219(a).

20/ The *700 MHz Narrowband R&O and NPRM* confirms that the Section 90.543 ACP limits were intended to apply to base station transmitters, not signal boosters. *See, e.g.*, *700 MHz Narrowband R&O and NPRM* ¶ 10 ("Section 90.543(a) of the Commission's rules establishes adjacent channel power (ACP) emission limits for 700 MHz narrowband *base station* transmitters.") (emphasis added); *id.* ("The ACP limits are designed to reduce unwanted emissions from base station transmitters operating in the 769-775 MHz band into adjacent channels and other parts of the spectrum . . .").

applied to signal boosters.[21/] If signal boosters operating in the 700 MHz wideband public safety spectrum were expected to comply with Section 90.543, the Commission would have accounted for that or at least mentioned it in the *FirstNet R&O*, particularly in light of the record – recounted in the *700 MHz Narrowband R&O and NPRM* – regarding the inability of signal boosters to comply with Section 90.543. The fact that the Commission did not address signal boosters in the context of its revision of Section 90.543 in the 700 MHz wideband proceeding is further evidence that Section 90.543 was never intended to apply to signal boosters.

II. It Is Now Clear That Signal Boosters Should Be Governed Solely by Section 90.219.

A. The Specific Regulations Governing Signal Boosters Superseded the General Regulations Governing Transmitters in the 700 MHz Narrowband Spectrum.

The *Signal Booster Order* implemented a comprehensive regulatory regime governing signal boosters, which carefully considered and modified the rules governing signal boosters under Part 90.[22/] These new rules expressly governing signal booster operations superseded any general rules – like Section 90.543 – that could have been construed to apply to signal boosters. Nowhere in the new rules, or in the order adopting them, did the Commission exempt 700 MHz public safety signal boosters from Section 90.219. It is a basic tenet of administrative law that "normally the specific governs the general,"[23/] and the application of Section 90.219's signal-booster-specific requirements over Section 90.543's general transmitter rules is a straightforward application of this principle.

In any case, if the Commission believed that additional technical requirements – like the ACP limits in Section 90.543(a) – should apply to signal boosters, whether in the 700 MHz public safety narrowband spectrum or otherwise, it would have imposed them as part of its comprehensive *Signal Booster Order*. The *Signal Booster Order* created a complete set of technical requirements on the operation of signal boosters. For example, the Commission, among other things, required the suppression of spurious emissions such that they do not exceed -13 dBm within any 100 kHz measurement bandwidth, limited the noise figure to 9dB in either direction, required the suppression of emissions outside the service band for which the operator is authorized, clarified that operators may not amplify service bands where they do not have a license or licensee consent, prohibited a single Class B signal booster device from amplifying both commercial services and Part 90 services, provided guidance in

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21/ *FirstNet R&O* ¶¶ 19-26.

22/ *Signal Booster Order* ¶¶ 144-97.

23/ *Long Island Care at Home, Ltd. v. Coke*, 551 U.S. 158, 170 (2007) (finding that a specific employment regulation governed over a general one) (internal citations omitted); *see also RadLAX Gateway Hotel, LLC v. Amalgamated Bank*, 132 S. Ct. 2065, 2071 (2012) ("'[I]t is a commonplace of statutory construction that the specific governs the general.'") (*quoting Morales v. Trans World Airlines, Inc.*, 504 U.S. 374, 384 (1992)); *Morton v. Mancari*, 417 U.S. 535, 550 (1974) (discussing that a specific statute is not "controlled . . . by a general one").

the rules regarding maximum effective radiated power ("ERP") levels for noise and intermodulation, and supported a 5 watt ERP power limit.[24/] These requirements are generally contained in Section 90.219 of the rules.[25/] If the FCC believed that ACP limits were appropriate for the regulation of signal boosters, it would have addressed such limits as part of its sweeping reforms.

B. Section 90.219 Already Establishes Limits Intended to Mitigate Interference Concerns.

Provisions in Section 90.219 – such as the -13 dBm limit on spurious emissions, the requirement that installers of signal boosters use "good engineering practice," the obligation of licensees to correct any harmful interference, and the guidance provided regarding ERP levels – establish appropriate parameters for signal booster operations and effectively address any interference concerns.[26/] These rules were established on the basis of a fully developed record specific to signal booster operations. Section 90.219 represents a balanced approach for the regulation of signal boosters; the ACP limits in Section 90.543 were never intended to apply to signal boosters.

Even if the Commission concludes that Section 90.543 applies to signal boosters, there is no evidence that the limits there are appropriate for Class B signal boosters, particularly in view of newly adopted Section 90.219. In the *700 MHz Narrowband R&O and NPRM*, the Commission sought comment on whether there "[i]s any evidence that [Class B signal boosters] are creating interference problems."[27/] In response, three commenters expressed concern regarding the potential for signal boosters to cause interference.[28/] The statements made by all three commenters are conclusory and unsubstantiated. None of these parties provides any evidence of interference from signal boosters to 700 MHz public safety narrowband operations.[29/] As the Commission noted in the *Signal Booster Order*, the record "does not reflect widespread interference from the use of [Part 90 signal boosters]."[30/]

In any event, Section 90.219 now effectively mitigates interference concerns. There is no need for the Commission to continue to apply Section 90.543 to achieve interference protection. Section 90.219(b) regulates the circumstances under which PLMR licensees and non-licensees may deploy signal

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24/ *Signal Booster Order* ¶¶ 175-84.

25/ 47 C.F.R. § 90.219.

26/ *Id.*

27/ *700 MHz Narrowband R&O and NPRM* ¶ 133.

28/ *See* Comments by the Region 7 (Colorado) Regional Planning Committee Concerning the Seventh Report and Order and Notice of Proposed Rulemaking, PS Docket No. 13-87, *et al.*, at 5 (filed June 13, 2013); Comments of Harris Corporation, PS Docket No. 13-87, *et al.*, at 12 (filed June 18, 2013); Comments by the State of Florida to the Notice of Proposed Rulemaking, PS Docket No. 13-97, *et al*., at 7 (filed June 18, 2013).

29/ *See id.*

30/ *Signal Booster Order* ¶ 195.

boosters.[31/] If a licensee operates its own signal booster, it will engineer its operations to ensure that its signal booster does not cause interference to itself. Non-licensees must obtain the consent of the licensee of the amplified signal or, if signals are incidentally retransmitted and interference occurs, transmissions must cease or be altered at the request of the FCC or a licensee.[32/] Rules requiring the registration of Class B signal boosters will facilitate the identification and prompt resolution of any interference cases.[33/] These and other protections in Section 90.219 provide sufficient insurance that signal boosters will not create harmful interference and that if interference occurs, it will be handled quickly and effectively.[34/]

III. If the FCC Nonetheless Determines That Signal Boosters Constitute "Transmitters" Under Section 90.543, It Should Exempt Class B and Class A Signal Boosters from the ACP Requirements in Section 90.543(a).

A. It Will Be Impossible or Technically and Economically Burdensome for Signal Boosters to Comply with the Requirements of Section 90.543(a).

While Section 90.219 provides a far more effective mechanism for regulating signal boosters, if the Commission nonetheless determines that signal boosters constitute "transmitters" covered by Section 90.543, it should exempt signal boosters from Section 90.543(a)'s ACP limits as proposed by Dekolink in June 2008.[35/] An exemption is necessary because signal boosters are unable to comply with Section 90.543(a)'s ACP limits without affecting the fundamental technology and economics of signal booster production.[36/]

Signal boosters are significantly different from the base stations that Section 90.543 is intended to regulate. Signal boosters – including both Class A and Class B signal boosters – transmit *multiple signals*. They cannot practically comply with the requirements of Section 90.543(a) because those requirements were created for *single signal* transmitters.

Similarly, signal boosters typically transmit at a power level of 1 to 5 watts, while base stations are permitted to operate at much higher power. More stringent rules governing adjacent channel protection are required for higher power operations, but produce unnecessarily restrictive results if applied to lower-power devices. A 1 watt (30 dBm) signal booster under Section 90.219 is only

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31/ 47 C.F.R. § 90.219(b).

32/ *Id.* § 90.219(b)(1)(i),(ii).

33/ *Id.* § 90.219(d)(5).

34/ *Id.* § 90.219.

35/ *700 MHz Narrowband R&O and NPRM* ¶¶ 130-35.

36/ *See id.* ¶ 133 (seeking comment on technical, cost, and operational limitations preventing Class B signal boosters from being designed to meet Section 90.543's ACP limits).

required to comply with a -13 dBm level.[37/] However, that same transmitter, if required to comply with the base station ACP limits in Section 90.543(a), would be required to operate at a maximum level ranging from -46 dBm to -50 dBm.

If signal boosters were forced to comply with the -46 dBm to -50 dBm limits that Section 90.543 would require, it would be practically impossible or economically and technologically burdensome to do so. For instance, a signal booster manufacturer could theoretically attempt to comply by designing a signal booster with multiple amplifiers, using one amplifier for each individual signal. However, such a solution would be extremely costly, and such devices would consume significant amounts of power and dissipate significant amounts of heat. Even then, the product may not comply with Section 90.543. Another option would be the design of a special high power multicarrier amplifier ("MCPA"). But in order to meet Section 90.543(a)'s ACP limit of -80 dBc, the MCPA would be required to handle signals at a maximum level of 40 dB backoff below the IP3 point. This would require an enormous amplifier that would dissipate large amounts of heat, consume significant power, require a huge battery back-up, and be very expensive. Designing feed forward technology amplifiers to achieve compliance with Section 90.543 likewise would be an expensive, inefficient, and impractical solution. While analog pre-distortion technology is efficient, it would never be able to meet the level of intermodulation attenuation required by Section 90.543(a). Accordingly, while a theoretical solution could exist, it does not exist today and the outcome of those efforts would likely be products that are too costly and consume too much power to amount to a realistic solution.

As the *700 MHz Narrowband R&O and NPRM* notes, the ACP limits in Section 90.543(a) were designed "to minimize adjacent channel interference while accommodating a 'continuously evolving equipment market in ways that favor competition without favoring any particular technology.'"[38/] Instead of achieving this goal, imposing the ACP requirements of Section 90.543(a) on signal boosters would devastate the signal booster equipment market.

B. Application of Section 90.543(a) to Signal Boosters Generally, and Distributed Antenna Systems Specifically, Would Hinder Important Public Safety Initiatives.

Prohibiting signal boosters from operating in the 700 MHz narrowband public safety spectrum – the likely outcome if the Commission continues to apply Section 90.543 to signal boosters – would significantly hinder the very public safety operations that Part 90 signal boosters are intended to support. In the *Signal Booster Order*, the Commission explained that "both rural and metropolitan police departments rely on signal boosters to extend land mobile coverage in areas of limited service. First responders, including emergency medical personnel, also use signal boosters to improve

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37/ 47 C.F.R. § 90.219(e)(3).

38/ *700 MHz Narrowband R&O and NPRM* ¶ 129 (*quoting Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communications Requirements Through the Year 2010*, First Report and Order and Third Notice of Proposed Rulemaking, 14 FCC Rcd 152, ¶ 138 (1998)).

communications during disasters and other emergencies."[39/] The *Signal Booster Order* also described how PLMR licensees have deployed signal boosters to address coverage issues and support public safety operations, for example, deploying signal boosters in airport terminals "to facilitate critical public safety communications" and in mines, tunnels, and large manufacturing complexes "to improve the safety and efficiency of American businesses."[40/]

As the *700 MHz Narrowband R&O and NPRM* observed, "many local jurisdictions have adopted ordinances requiring new and renovated buildings to provide coverage for first responders, which typically requires the installation of signal boosters to overcome signal loss from building walls and other attenuating factors."[41/] The Commission has asked whether requiring signal boosters to comply with Section 90.543's ACP limits would "adversely impact the ability of building owners to meet their obligations in this regard."[42/] That would be the precise result. Because current signal boosters cannot comply with Section 90.543, building owners would lack access to viable signal booster equipment, and first responders would be deprived of the critical coverage they require. Continuing to apply Section 90.543 to signal boosters would, therefore, produce a lose-lose result.

If the Commission applies Section 90.543 to signal boosters, it would presumably extend application of the rules to Distributed Antenna Systems ("DAS"), which are simply a form of signal boosters. As the Commission discussed in the *Signal Booster Order*, signal boosters include "all manner of amplifiers, repeaters, boosters, *distributed antenna systems*, and in-building radiation systems that serve to amplify signals between a device and a wireless network."[43/] Municipalities enacting the ordinances noted above often contemplate that DAS technology will be used in furtherance of public safety and other objectives. Subjecting signal boosters and DAS to the ACP limits in Section 90.543 will thwart these and other important public safety initiatives, reducing the utility of the 700 MHz public safety narrowband spectrum.

CONCLUSION

In view of the foregoing, Axell Wireless respectfully requests that the Commission only subject signal boosters operating in the 700 MHz public safety narrowband spectrum to the requirements of Section 90.219 of the Commission's rules that are directly applicable to signal boosters, rather than the requirements in Section 90.543 of the Commission's rules. If the Commission nonetheless determines that signal boosters constitute "transmitters" subject to Section 90.543, it should exempt Class B and

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39/ *Signal Booster Order* ¶ 8; *id.* ¶ 151 ("Signal booster systems play a crucial role in allowing public safety first responders to communicate in buildings, tunnels and other areas where signals would normally be blocked.").

40/ *Id.* ¶ 150.

41/ *700 MHz Narrowband R&O and NPRM* ¶ 135.

42/ *Id.*

43/ *Signal Booster Order* ¶ 3 n.1 (emphasis added).

Class A signal boosters from its ACP requirements. Taking such action will help ensure the continued successful use of signal boosters to support critical public safety operations in the 700 MHz narrowband spectrum. In the interim, the Commission should continue to approve requests for equipment authorizations for 700 MHz public safety signal boosters under the practice it adopted in response to Dekolink's 2008 request.[44/]

Respectfully submitted,

/s/ Rami Hasarchi
Rami Hasarchi
Director – Strategic Projects

cc: Brian Marenco (via e-mail)

44/ There is no basis for the Commission to stop processing requests for equipment authorization pending the outcome of this proceeding and doing so will only freeze in place the advantage that incumbent manufacturers have relative to those companies that wish to introduce new products.