

**Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, DC 20554**

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

REPLY COMMENTS OF SPRINT

Sprint Nextel Corporation (“Sprint”) hereby respectfully submits its reply to comments filed in response to the Notice of Proposed Rulemaking (NPRM) in the above captioned proceeding.¹ In this NPRM, the Federal Communications Commission (“Commission”) seeks comment on proposals for facilitating the development and deployment of well-designed signal boosters.

Sprint appreciates the Commission’s initiative to explore proposals that allow for the design, implementation and operation of signal boosters in ways that protect wireless licensees from interference while providing enhanced coverage to consumers. As Sprint indicated in its initial 2010 Comments in this proceeding, properly designed and installed signal boosters can aid wireless subscribers by expanding the usability of wireless networks in areas of poor signal coverage; however, many signal boosters sold and deployed today cause harmful interference or degrade the performance of wireless networks as a result of flawed design, poor installation, or lack of coordination.²

¹ *Notice of Proposed Rulemaking*, WT Docket No. 10-4, April 6, 2011 (“NPRM”).

² *Comments of Sprint Nextel* (“2010 Comments”), WT Docket No. 10-4, February 5, 2010, at 1.

The NPRM proposes new technical, operational, and coordination parameters for fixed and mobile signal boosters. Numerous parties provided comments on and proposed significant modifications to the specific approaches proposed in the NPRM. Sprint concurs with many of those comments and proposals. For example, Sprint supports CTIA’s request that the Commission affirm that a license or a licensee’s consent is required to operate a signal booster and that the sale of signal boosters to unauthorized parties is illegal.³ Sprint also concurs with CTIA’s proposal to require specific capabilities in signal boosters that would help diminish the risk of interference. Such capabilities include requiring a signal booster to incorporate technology that would enable a wireless licensee to locate and remotely shut off improperly operating signal boosters, and permitting signal boosters to re-transmit only those frequencies authorized for use by a commercial wireless licensee.⁴

Sprint agrees with T-Mobile’s proposals that consumers should be required to register signal boosters before operating the devices and that wireless licensees have the right to prohibit the use of signal boosters that degrade network performance or otherwise cause interference.⁵ Sprint also supports the comments of the DAS Forum regarding the desirability of creating different regulatory approaches for professionally-installed signal boosters versus consumer signal boosters.⁶

Sprint acknowledges Verizon Wireless and Wilson Electronics for creating a detailed “Joint Proposal” framework for the design, authorization, operation and

³ *Comments of CTIA – The Wireless Association*®, July 25, 2011, at 5-14.

⁴ *Ibid.*, at 15-18.

⁵ *T-Mobile USA, Inc. Comments*, July 25, 2011, at 8-14.

⁶ *Comments of The DAS Forum (A Membership Section of PCIA – the Wireless Infrastructure Association)*, July 25, 2011, at 5-7.

installation of signal boosters with a goal of ensuring better protection against harmful interference.⁷ Sprint generally supports this Joint Proposal, though additional specificity is needed in some areas in order to ensure the efficacy and enforceability of the proposed requirements. In particular, Sprint supports the proposed separation of signal boosters into three categories – 1) Carrier Installed Boosters, 2) Certified Engineered and Operated (“CEO”) Boosters, and 3) Consumer Boosters.

Carrier Installed Boosters. Sprint agrees with the Joint Proposal that carrier-installed boosters, installed by licensees or their authorized installers that operate on the licensee’s frequency bands, should not be subject to new Commission requirements.

CEO Boosters. Sprint generally agrees with how the Joint Proposal would treat CEO boosters. As discussed in its 2010 Comments, Sprint field engineers have spent many hours tracking down and correcting interference problems caused by the poor design or installation of signal boosters.⁸ This has been a particular problem when some purported communications “experts” have installed 800 MHz signal boosters, intended to amplify public safety signals, that also amplify Sprint’s 800 MHz wireless operations. 800 MHz signal booster systems must be properly designed, installed, and fully coordinated with all public safety and commercial networks in the band.

The Joint Proposal would address these problems by requiring, among other things:

- development and enforcement of standards for CEO boosters and CEO booster installation;

⁷ *Ex Parte* Letter from John T. Scott, III and Andre J. Lachance, Attorneys for Verizon Wireless, and Russell D. Lukas, Attorney for Wilson Electronics, Inc., dated July 25, 2011.

⁸ 2010 Comments, *supra.*, at 3.

- installation and engineering of CEO boosters by installers certified by an industry organization;
- coordination of CEO booster installations with the appropriate wireless licensees;
- documentation of CEO booster installations (including 24-hour contact information, to turn off CEO boosters in case of interference) in a licensee-accessible database; and,
- completion of on-site testing before a CEO booster installation is activated.

Sprint suggests a few additional requirements related to CEO booster installations. First, the Commission should make it clear that boosters and booster installations that do not meet the CEO booster, consumer booster, or licensee-installed booster requirements are illegal and may not be operated. Second, the Commission should apply and enforce Section 2.803 of its rules against the marketing of non-compliant boosters or the marketing of CEO boosters to any party other than a certified installer or a wireless network licensee. Third, Sprint suggests that the Commission require CEO boosters to have a label indicating the booster may only be sold to certified CEO installers or FCC wireless network licensees, and that the booster may only be operated if it has been installed by a certified installer and its operation has been coordinated with the appropriate FCC wireless licensees. To ensure expeditious progress on the above-proposed CEO booster standards, Sprint suggests that the Commission identify the proper forum for the development of CEO booster standards, and that the Commission establish a reasonable deadline (perhaps 12 months) for completing such standards.

Consumer Boosters. The Joint Proposal contains numerous technical and operating requirements that would apply to consumer boosters. The Joint Proposal was developed over a period of several months in response to the NPRM, based on significant work by Verizon Wireless and Wilson Electronics. However, other parties such as Sprint have only had a short period to consider and provide comments on the proposal. Sprint recommends that wireless licensees be given additional time to consider the details of the Joint Proposal, particularly since consumer boosters are intended to operate with a wide variety of radio technologies and in many different frequency bands. We also note that detailed test procedures will need to be developed in order to ensure that consumer boosters testing can be conducted in a consistent and reliable manner. Thus, Sprint would support the formation of a joint technical group to assess the suitability of the technical requirements and parameters contained in the Joint Proposal as they pertain to consumer boosters and to develop detailed test procedures. The joint technical group would be open to participation by all wireless network operators and licensees, as well as signal booster manufacturers and other interested parties, and would conduct its work primarily through electronic meetings and via correspondence.

Sprint has identified several questions regarding the Joint Proposal that warrant consideration and review by a joint technical group. For example, are the proposed requirements for consumer boosters adequate to ensure that the boosters will operate properly with all existing and planned radio technologies? Does the current proposal adequately ensure that existing power control mechanisms – which are critical to ensuring the efficient operation of the network – will continue to operate properly? Are the proposed AGC and uplink squelch parameters sufficient to avoid the amplification of

unwanted signals, either from devices located at a distance from the booster or on frequencies outside the intended channel of operation? Are additional requirements needed to address potential intermodulation problems with mobile devices that operate simultaneous voice and data transmissions on different frequencies (and potentially in different frequency bands)? Would the presence of a consumer booster adversely impact the ability of an LTE mobile device to implement Additional – Maximum Power Reduction (A-MPR) in order to comply with spurious emission limits or other requirements? Should consumer boosters be required to comply with existing radio access standards for similar products?⁹ Should additional Automatic Gain Control (AGC) parameters be specified so as to avoid potential jitter problems? Should the consumer booster be required to include a downlink squelch so that it would turn off the uplink amplification if sufficient downlink signal is received?¹⁰ Should the Anti-Oscillation Protection requirements be modified to require only three restarts (instead of five restarts suggested in the Joint Proposal) since the operator would naturally reset the device to correct the problem anyhow and the environment around the signal booster would not have changed appreciably?¹¹

Sprint also believes that the joint technical group and the Commission should consider the adoption of certain additional requirements for consumer boosters. For

⁹ CommScope suggests, for example, that signal boosters abide by the testing methods and performance requirements under the 3rd Generation Partnership Project (“3GPP”) TS 25.143 standard for repeater conformance testing (the UTRA repeater conformance testing). *Comments of CommScope, Inc.*, WT Docket No. 10-4, July 25, 2011, page 3.

¹⁰ For example, Sprint suggests that if the received downlink input signal from the base station to the consumer booster is ≥ -87 dBm (including inside a building without using an external antenna) for any period of time exceeding 0.25 seconds, the uplink would be disabled until the signal level reduces to -90 dBm for a period of 0.30 seconds. A signal level of ≥ -87 dBm should be sufficient to ensure good reception without the need of the booster’s amplification.

¹¹ The extra restarts would seem to be unnecessary and could result in additional unneeded interference.

example, the Commission should consider the feasibility of adopting a requirement that consumer boosters transmit unique identification information that could be matched to the consumer booster database so that the owner of a consumer booster could be contacted if it causes interference. Similarly, the Commission should consider requiring consumer boosters to provide their location information to the network.¹² The Joint Proposal discusses the potential for a Bluetooth connection to be made between the mobile device and consumer booster unit, permitting the consumer booster to be registered with the wireless licensee. If such Bluetooth connection can be established, then the mobile device itself could be used to transmit the information identifying the consumer booster and the location of the booster. The Bluetooth connection could also potentially be used by a wireless licensee to instruct the consumer booster to shut down if interference occurs, potentially eliminating the need for a consumer booster database. While Sprint supports the development of Bluetooth capability for passing information between the consumer booster and the wireless network, Sprint notes that there are many mobile devices that do not support Bluetooth; thus the Commission and the joint technical group should consider whether alternative approaches for passing information are feasible.

Sprint submits that, given the large quantity and variety of consumer boosters that may become available, the Commission should establish mechanisms to ensure that

¹² Sprint notes that on many occasions it has taken numerous hours to locate and identify the owners of a signal booster that is not operating properly. One recent example involves a malfunctioning signal booster that went into oscillation while operating from the 49th story of an apartment building in downtown Chicago. During the three-day period it took to locate the booster and have it turned off, this signal booster caused over 50,000 dropped calls on four key cell sites. Sprint understands that this booster had anti-oscillation protection circuitry and other features similar to those proposed in the Joint Proposal, but that the device malfunctioned and continued to operate until it was turned off. If the device has transmitted location and unique identification information to the wireless network, resolution of the interference could have occurred much more quickly.

consumer boosters, including ones that have undergone testing for certification, do not cause unintended disruption of the proper functioning of a mobile device on a network. Wireless licensees, such as Sprint, require testing today of most devices that can be used on their networks to ensure that they operate according to the appropriate radio access network standard and don't cause harm to network operations. Sprint asserts that the FCC's equipment authorization procedures for consumer boosters should be redesigned to provide an opportunity for wireless licensees or independent test labs to test any consumer booster prior to grant of FCC equipment authorization. Sprint realizes that such a requirement might raise concerns among signal booster manufacturers and others that products would be delayed in arriving on the market. However, the Commission could avoid such concerns by setting very specific deadlines for such testing to occur. Sprint suggests, for example, that the Commission could open a thirty-day window, after the filing of an FCC application for certification of a signal booster, during which a wireless licensee or its representative could request a sample of the signal booster for testing. The testing would have to be completed and the results submitted to the FCC within 90 days of receiving the consumer booster sample. If the testing showed the product would not comply with the radio access standard or would degrade performance of the network, the Commission could postpone grant of the equipment authorization until the issues raised by the wireless licensee are addressed. The Commission should also establish practices that would support similar testing of consumer boosters that become certified under the proposed consumer booster rules. It has been Sprint's experience that some consumer devices that reach the marketplace do not perform identically to those that are tested for FCC approval. Given the potential of significant

interference of improperly designed or malfunctioning consumer boosters, the Commission should have speedy procedures in place to respond to any post-grant testing that indicates problems with a specific consumer booster model.

Sprint notes that the Joint Proposal would permit consumer boosters to operate only in the cellular, broadband PCS, AWS, and 700 MHz wireless bands. The Joint Proposal recommends that consumer boosters be excluded from 800 MHz bands until 800 MHz Reconfiguration has been completed. Sprint generally concurs with that recommendation, although Sprint notes that a number of other frequency bands may be appropriate for the use of consumer boosters, perhaps after further study is completed. For example, operations in the BRS/EBS band at 2.5 GHz are currently performed using time-division duplexing (TDD), which would not appear to lend itself to the typical signal booster used today.¹³

¹³ Today's signal boosters do not have the ability to precisely time their transmissions for the short time intervals that a TDD device would be alternating between transmitting and listening.

In conclusion, Sprint is fully supportive of the Commission's initiative to bring well-designed signal boosters to market. Sprint recognizes the desire to bring improved coverage to wireless consumers, but respectfully submits that further study is needed to prevent poor quality signal boosters from disrupting or degrading the quality and performance of wireless communications networks.

Respectfully submitted,

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