

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 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
CELLPHONE-MATE, INC.**

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SUMMARY

The Commission can address each of the potential interference concerns that have been identified in this proceeding by adopting three basic and technologically neutral requirements for signal booster equipment. Specifically, the Commission should require only that:

- all signal boosters must comply with the various technical rules for each wireless service, including maximum power levels and out-of-band emissions, and shutdown if power levels are exceeded;
- all signal boosters must be able to detect and prevent oscillation either by shutting down or using other corrective measures; and
- all signal boosters must be able to detect when they are near or nearing the base station of a wireless carrier and either reduce power or shutdown to prevent receiver overload.

These basic requirements should be applied to all signal boosters, regardless of whether they are used in fixed or mobile environments, in consumer or commercial applications, or sold by retail distributors, independent professional installers, or wireless carriers.

The proposed regulations outlined above would address each of the potential interference concerns identified by the Commission in the *NPRM*. Notably, no party that filed comments in this proceeding identified any additional interference concerns that could result from the continued growth of the wireless signal booster market segment.

The Commission should also refrain from adopting regulations for signal boosters that are overly burdensome, technically non-neutral, and of questionable efficacy in preventing interference. In this regard, the joint proposal that was submitted to the Commission by Verizon Wireless and Wilson Electronics includes many provisions that are unnecessary to address potential interference and restrict excessively the existing design and future innovation of signal booster equipment. Although Cellphone-Mate is still reviewing the details of the Verizon/Wilson joint proposal, the following major deficiencies are already apparent:

- No justification exists to place burdensome requirements on professional installers of commercial signal booster systems (even more burdensome than proposed for consumer devices), such as unnecessary coordination, consent, database management and certification requirements. Such rules are entirely unnecessary given the fact that the vast majority of interference complaints have involved inexpensive consumer devices.
- No justification exists to restrict the transmit power levels of signal boosters to levels that are below what has already been approved by the Commission for wireless handsets. Such a restriction would impair significantly the reach and utility of signal booster equipment.
- No justification exists for limiting the downlink (booster to handset) power level of signal boosters to 0.05 Watts. Such a power limit would be insufficient for use in many business and commercial situations.
- The Commission also should refrain from imposing arbitrary limits of the gain of signal boosters. Other technological approaches can prevent oscillation and interference without freezing the technical capabilities and reach of signal boosters at an arbitrary level.
- No reason exists to require that all signal boosters be bi-directional. Single-direction, downlink only, signal boosters do not raise any special interference concerns to wireless carriers and may serve a future market segment, such as asymmetrical wireless data transmission.
- The Commission should not micromanage the design of signal boosters, for example, by requiring the use of certain RF connectors for mobile versus fixed signal boosters. The Commission should instead permit manufacturers to develop their own methods to comply with the interference prevention requirements.
- The Commission should also refrain from micromanaging the electrical input power of signal booster equipment. Instead, the Commission should facilitate continued innovation by permitting manufacturers to develop their own technical measures to ensure that their products do not cause harmful interference.

By employing the targeted, effective and technology neutral requirements identified by Cellphone-Mate in these reply comments, the Commission can achieve the goal of preventing harmful interference to wireless networks, while facilitating continued innovation, growth and use of signal booster equipment by consumers and businesses to increase their access to wireless broadband networks.

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To: The Commission

**COMMENTS OF
CELLPHONE-MATE, INC.**

Cellphone-Mate, Inc. (“Cellphone-Mate”), by its attorneys and pursuant to Section 1.415 of the Commission’s Rules, 47 C.F.R. § 1.415, hereby files reply comments addressing the comments that were filed in response to the Notice of Proposed Rulemaking (“*NPRM*”) in the above captioned proceeding.¹

The Commission upholds “long-standing policies of maintaining technical and service neutrality in its rules.”² To this end, the Commission seeks to avoid adopting rules “that mandate the use of a particular technology or service.”³ The Commission’s policy of technological neutrality, along with its policies of “pro-competitive” and “transparent”

¹ See 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*, FCC 11-53, WT Docket No. 10-4 (April 6, 2011) (“*NPRM*”).

² Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band, 25 FCC Rcd 11710, ¶ 28 (2010).

³ *Id.*

regulation, are identified in the National Broadband Plan as “the basic foundations of the U.S. international telecommunications agenda.”⁴ As Chairman Julius Genachowski has explained, “we also believe that any regulation should be effective and targeted, not micromanagement, and that it should strive for technological neutrality.”⁵

Unfortunately, the rules for signal boosters that have been proposed by some of the parties in this proceeding are not technically neutral. Nor would they be effective, transparent, or targeted. Instead, some of the proposals that have been presented to the Commission, particularly the joint proposal of Verizon Wireless and Wilson Electronics, would immerse the Commission in micromanagement, imposing overly detailed regulations that would be unnecessary to prevent interference, potentially confusing, difficult to enforce, and could promote arbitrarily the technologies and product lines of some manufacturers and distributors over others.

In stark contrast, the interference concerns identified by the Commission in the *NPRM* can be addressed effectively through very targeted and technology neutral measures that will not require the creation of expensive, burdensome and potentially anti-competitive rules and procedures. Specifically, the Commission should require that all signal boosters satisfy the following technically neutral requirements:

- all signal boosters must comply with the various technical rules for each wireless service, including maximum power levels and out-of-band emissions, and shutdown if power levels are exceeded;

⁴ Connecting America: The National Broadband Plan, Federal Communications Commission, at 60 (March 16, 2010).

⁵ *ICT: Global Opportunities and Challenges*, Prepared Remarks of Chairman Julius Genachowski Federal Communications Commission at the International Telecommunication Union Global Symposium for Regulators, Beirut, Lebanon, 2009 FCC LEXIS 5717 (rel. Nov. 10, 2009).

- all signal boosters must be able to detect and prevent oscillation either by shutting down or using other corrective measures; and
- all signal boosters must be able to detect when they are near or nearing the base station of a wireless carrier and either reduce power or shut down to prevent receiver overload.

These basic requirements should be applicable to all signal boosters, regardless of whether they are used for fixed, mobile, or a combination of the two purposes. These requirements should also be applied to all signal boosters regardless of whether they are marketed for the consumer market, or for commercial installation. Finally, these rules should be applied to all signal boosters regardless of whether they are marketed and sold by independent manufacturers and dealers, or by the various wireless carriers.

The use of a single set of rules by the Commission will ensure the efficacy of the requirements, prevent confusion in the marketplace, and ensure that the rules are not misused by carriers or manufacturers to gain a competitive advantage in the sale of signal booster equipment. Most importantly, the use of the targeted and narrowly-focused regulatory approach described above will facilitate the continued growth of the relatively young market for signal booster equipment, thereby enabling an increasing number of consumers to benefit from the additional broadband connectivity that signal boosters provide.

I. THE COMMISSION SHOULD ADOPT REGULATIONS FOR SIGNAL BOOSTERS THAT ARE EFFECTIVE, TARGETED AND TECHNOLOGY NEUTRAL

The Commission's *NPRM* identified specific interference concerns that could result from the marketing and use of poorly designed, improperly installed or malfunctioning signal boosters.⁶ None of the comments that were filed in this proceeding identified any additional

⁶ See *NPRM*, ¶ 14.

interference concerns that were not summarized in the *NPRM*. Specifically, the *NPRM* identified the following possible issues involving the potential for harmful interference to wireless networks:

- Oscillation or feedback resulting when the signal from the internal antenna of a signal booster reaches the external antenna of the device.⁷
- Adjacent channel noise or near-far problems resulting from a wideband signal booster transmitting at a relatively high power to a distance base station and, as a result, injecting excessive noise into the nearby base station of another carrier.⁸
- Base station receiver overload resulting from signal boosters that amplify the power of wireless signals even when such amplification is not needed, such as when a mobile signal booster comes within proximity of the base station,⁹ and
- Public safety/Sprint Nextel issues resulting from signal boosters used to amplify the signals of public safety communications in frequencies bands that are still interleaved with Sprint Nextel frequencies potentially overloading nearby Sprint Nextel base stations.¹⁰

The first of the four above-listed concerns (oscillation and feedback) clearly can be resolved by requiring signal boosters to detect oscillation or feedback and shutdown or employ other corrective measures to prevent oscillation from occurring. The use of oscillation detection capabilities was widely supported by parties filing comments in this proceeding.

The second and third of the above-listed concerns both involve what is essentially the same technical issue – signal boosters that continue to transmit at relatively high power while near or nearing the base stations of a wireless carrier (either the serving carrier, or a competing

⁷ See *id.*, ¶ 16.

⁸ See *id.*, ¶ 15.

⁹ See *id.*, ¶ 17.

¹⁰ See *id.*, ¶ 18.

carrier) and overload the base station receiver for that carrier.¹¹ Numerous proposed solutions have been presented by various parties to address this concern, including coordination, mandatory narrow banding, carrier-controlled remote shutdown, excessive limits on power and antenna gain, electrical power input restrictions, and other potentially burdensome requirements.

None of these possibly approaches, however, would be as targeted and effective as a requirement that:

1. all signal boosters must be able to detect when they are approaching a base station that is using frequencies within the range of that signal booster (regardless of whether the booster is a wideband or narrowband device), and
2. reduce power or shutdown in order to avoid overloading the receiver of that base station.

Although such an approach is not devoid of technical complexity for manufacturers of signal boosters, this approach would be vastly easier to implement successfully than numerous other of the proposed solutions, particularly such approaches as enabling carrier-controlled remote shutdown capabilities. Further, such an approach would be designed to *prevent* receiver overload from occurring. In contrast, remote shutdown capabilities could only correct

¹¹ The fourth issue is somewhat related, but focuses more on out-of-band emissions into adjacent interleaved bands, some of which are used for public safety, some for private networks, and some for commercial radio services such as Sprint Nextel. The problems resulting from interleaved channels are being addressed in the 800 MHz proceeding. See *Improving Public Safety Communications in the 800 MHz Band, Report and Order, Fifth Report and Order, Fourth Memorandum Opinion and Order, and Order*, 19 FCC Rcd 14969 (2004); *Erratum*, WT Docket No. 02-55 (rel. Sep. 10, 2004); *Second Erratum*, 19 FCC Rcd 19651 (2004); *Third Erratum*, 19 FCC Rcd 21818 (2004); *Supplemental Order and Order on Reconsideration*, 19 FCC Rcd 25120 (2004); *Erratum*, WT Docket No. 02-55 (rel. Jan. 19, 2005); *Memorandum Opinion and Order*, 20 FCC Rcd 16015 (2005); *Order*, 21 FCC Rcd 5503 (2006); *Second Memorandum Opinion and Order*, 22 FCC Rcd 10467 (2007); *Erratum*, WT Docket No. 02-55 (rel. July 26, 2007); *Third Memorandum Opinion and Order*, 22 FCC Rcd 17209 (2007); *Second Report and Order*, 23 FCC Rcd 7605 (2008), *Erratum*, WT Docket No. 02-55 (rel. May 28, 2008); *Fourth Memorandum Opinion and Order*, 23 FCC Rcd 18512 (2008).

interference problems that are already occurring and could not prevent such interference in the first place.

Designing signal boosters to reduce power or shutdown to avoid base station receiver overload would also be far more effective than other approaches that have been proposed. For example, the use of a national database and registration process to permit wireless carriers to monitor the use and whereabouts of signal boosters would likely suffer from widespread problems involving non-compliance and out-of-date information.

In addition, as the Commission has acknowledged, a coordination requirement would also be insufficient to prevent harmful interference because signal boosters used for mobile purposes cannot be coordinated and also because consumers are likely to relocate fixed signal boosters on occasion without updating their database and coordination information.

A requirement that signal boosters reduce power or shutdown to avoid base station receiver overload would also be far less expensive to implement than some of the solutions that have been raised. For example, many carriers have advocated that all signal boosters be restricted to narrowband capabilities, transmitting only in the frequencies of a single wireless carrier. Narrowband requirements, however, would be very expensive to implement, both in terms of the cost of each unit and the resulting need for enterprise users to purchase multiple boosters in order to amplify the signals of multiple wireless carriers. A narrowband requirement also would not by itself prevent signal overload into the receivers of wireless carriers, it would only limit that interference to the wireless carrier that is providing service to the signal booster in question.

In contrast, a general requirement that all signal boosters reduce power or shutdown when nearing any base station that is using frequencies within the range of that signal booster would

prevent receiver overload to all wireless networks and would do so without placing burdensome requirements on the users or manufacturers of signal booster equipment.

The Commission should therefore require only that signal booster satisfy the requirements described above. Further, the Commission should refrain from adopting any aspect of the overly detailed, complex, and technologically non-neutral joint proposal that was submitted to the Commission by Verizon Wireless and Wilson Electronics.

II. THE COMMISSION SHOULD AVOID ADOPTING RULES THAT ARE NOT TARGETED OR TECHNOLOGY NEUTRAL AND WOULD MICROMANAGE THE SIGNAL BOOSTER MARKET SEGMENT

In an apparent effort to develop a compromise approach to the regulation of signal boosters by the Commission, Verizon Wireless and Wilson Electronics submitted a joint proposal that seeks to divide signal boosters into three categories and regulate each group using a different set of very detailed technical restrictions and operational and design requirements. However well intentioned were the parties to this effort, the resulting proposal should not be adopted by the Commission because it would harm significantly the fledgling market for signal booster equipment without addressing in a targeted or technologically neutral manner the interference concerns identified by the Commission in the *NPRM*.

Although Cellphone-Mate has not yet had an opportunity to identify and assess the unintended regulatory consequence of every aspect of the Verizon/Wilson joint proposal, Cellphone-Mate has identified a number of major shortcomings and unnecessary regulatory impediments, which are discussed in the following sections of these reply comments.

A. Coordination Requirements are Unnecessary for Signal Boosters, Particularly Those that Would be Professionally-Installed for Commercial Customers

As Cellphone-Mate explained in its comments in this proceeding, it is unnecessary and would be exceedingly burdensome to impose coordination requirements for signal boosters. The *NPRM* even acknowledged that such coordination requirements are unnecessary, proposing them only for fixed signal boosters and not for mobile signal boosters.

Wilson Electronics and Verizon Wireless also appear to acknowledge that coordination requirements are unnecessary for signal boosters, recommending in their joint proposal that signal boosters used by individual consumers only be registered, and not coordinated with wireless carriers.¹²

Inexplicably, however, the Wilson/Verizon joint proposal calls for the imposition of detailed and very burdensome coordination and consent requirements for signal boosters that are professionally installed for commercial customers, which Wilson and Verizon identify as Certified Engineered and Operated (“CEO”) signal boosters.¹³ The proposed rules for professionally installed signal boosters include requirements that all commercial installations complete and pass carrier-approved testing procedures for each installation apparently before installation begins.¹⁴ Professional installers would also be required to maintain a database of their customer installations, which must include proprietary and often sensitive information such

¹² *Letter from John T. Scott, III and Andre J. Lechance, Attorneys for Verizon Wireless and Russell D. Lukas, Attorneys for Wilson Electronics, Inc.*, WT Docket No. 10-4, at 2 (July 25, 2011) (“Wilson/Verizon Joint Proposal”); *see also id.*, Attachment A, Consumer Booster Specifications for CMRS Spectrum Bands, V-Comm, L.L.C., at 7-8 (July 25, 2011).

¹³ *See id.*, Attachment B, Industry Certified Signal Booster Program, V-Comm, L.L.C., at 5-7 (July 25, 2011).

¹⁴ *See id.* at 3.

as details regarding software remote control requirements and account security information.¹⁵ Professional installers of signal booster equipment also would be obligated to be available to respond to inquiries from carriers and their agents on a 24/7 basis.¹⁶

The only explanation that Wilson and Verizon provide for their proposed disparate treatment of professionally installed signal boosters is the fact that such installations involve “larger, higher powered signal boosters designed for large offices, campuses and similar settings.”¹⁷ As Verizon explains in its comments, professionally installed boosters “are often complex,” sometimes using multiple and different types of donor and serving antennas, amplifiers, combiners and splitters.¹⁸ Verizon further claims that professionally installed boosters may carry significant traffic, sometimes requiring CMRS carriers to re-engineer the donor cell site to handle the additional traffic load.¹⁹

Granted, professionally installed signal boosters are often more complex than equipment used by consumers. Much of this additional complexity involves technical and monitoring capabilities that prevent interference. Professionally installed signal boosters are generally designed with far more sophisticated self-monitoring and protection circuitry than the devices sold in the consumer market. Professionally installed signal boosters are also usually designed to be more linear in their signal transmissions than consumer equipment. As a result, professionally

¹⁵ *See id.* at 2; *see also id.*, Attachment B at 9-10.

¹⁶ *See id.*, Attachment B at 10.

¹⁷ *Id.* at 1.

¹⁸ *See Comments of Verizon Wireless*, WT Docket No. 10-4, at 4-5 (July 25, 2011).

¹⁹ *See id.* at 5.

installed signal boosters produce less noise into wireless networks and, as a result, less potential for interference.

The additional complexity is also enhanced by the involvement of the professional installers that design and operate commercial amplification equipment. Most professional installation companies not only market and install commercial signal boosters, but also provide ongoing monitoring and maintenance to prevent system faults and outages.

These professional installers have substantial incentives to employ a high level of RF engineering expertise to the design, installation and operation of amplification systems. Professional installers are often hired by commercial customers to support mission critical communications capabilities, a fact that commercial customers often emphasize in their requests for proposals for such systems and services.

Despite the numerous precautions and technological enhancements that are incorporated into the design and installation of commercial signal booster systems, such equipment usually does not operate at uplink transmit power levels that are any greater than those employed by consumer devices. Thus, the risks posed by commercial signal boosters of causing harmful interference to wireless networks are substantially lower than the risks posed by consumer equipment, the numbers of which are far more substantial. These facts are supported by the record in this proceeding, in which the majority of complaints of alleged harmful interference resulted from “poorly designed and manufactured, disposable signal boosters”²⁰ and not from professionally installed signal amplification equipment that was designed for a commercial environment.

²⁰ *NPRM*, ¶ 20, n.30 (quoting Cobb County E911 Comments at 1-2).

The fact that professionally installed signal booster also may carry significant traffic does not justify coordination and consent requirements for such installations. In nearly every instance in which a business or commercial venture installs a commercial signal booster system it has done so to manage the routing of wireless traffic that either already exists at that location or, in the case of new construction, is anticipated to exist once the construction has been completed. Therefore, commercial signal boosters do not generate appreciably greater amounts of wireless traffic than would exist in a particular location absent the existence of an amplification system, they simply help manage that traffic in a more reliable and effective manner.

Not only are coordination and consent requirements unnecessary for professionally installed signal boosters, but they would also harm competition and growth in this relatively new market segment. Although the major wireless carriers are likely to market their own signal booster products to both the consumer and commercial market segments, they are expected to provide the most significant competitive threat in the commercial market, offering business customers the same types of complex in-building amplification systems that a growing number of independent companies provide to the commercial market segment today. Wireless carriers that compete in the commercial market segment are likely to lack sufficient incentive to coordinate and approve on a good faith basis the commercial installations of their independent competitors. Therefore, coordination and consent requirements would likely reduce significantly the continued growth of competition in this market segment, to the obvious harm of consumers.

Given these facts, no justification exists to impose far more burdensome requirements on professionally installed signal boosters. In fact, the opposite is true. As the Commission has concluded on repeated occasions, professionally installed communications equipment raises

significantly fewer concerns regarding harmful interference than consumer installations.²¹ Thus, if any disparate treatment is warranted, it should be toward additional regulations addressing the consumer market.

Cellphone-Mate believes, however, that no disparate treatment is warranted or justified between signal boosters designed for consumer and commercial markets. Instead, the Commission should regulate all signal boosters in an identical manner using the targeted and technologically neutral regulatory framework that is described in the opening sections of these reply comments.

B. The Commission Should Not Require Professional Installers and Operators of Signal Boosters to be Certified by an Industry Organization Such as CTIA

As noted above, the majority of complaints regarding allegations of interference from signal boosters have involved inexpensive consumer devices. For this reason, it is unclear why Verizon and Wilson have proposed to require that a certification process be developed for professional installers and operators of commercial amplification systems, and the certification process be managed by an industry organization such as CTIA.²²

Neither Verizon nor Wilson has explained why such a certification process is needed to address professionally installed systems, when such systems are not the primary source of interference complaints. Furthermore, CTIA, which historically strongly opposed the authorization and use of after market signal boosters, may be unable to provide the impartiality

²¹ For example, the Commission's antenna coupling requirements for unlicensed devices do not apply to Part 15 equipment that is professionally installed. *See* 47 CFR § 15.203; *see also* 47 C.F.R. § 15.231 (establishing more lenient requirements for security alarm transmitters that are professionally installed).

²² *See Verizon/Wilson Joint Proposal* at 2; *see also id.*, Attachment B at 4.

and independence that is generally required of an industry certification organization. For these reasons, the Commission should reject this proposal as unnecessary, potentially anti-competitive and harmful to consumers.

C. The Commission Should Permit Signal Boosters to Employ Uplink Power Levels That are No More Stringent Than the Power Restrictions for Wireless Handsets

The *NPRM* proposes that wireless signal boosters be required to comply with the transmit power limits that are applicable to wireless handsets in each of the various wireless services.²³ As discussed in the opening section of these reply comments, Cellphone-Mate supports this proposal as reasonable and justified to prevent excessive power into base station receivers.

The Verizon/Wilson joint proposal, however, calls for the adoption of a 1 Watt EIRP power limit for all signal booster systems,²⁴ which is substantially more stringent than the restrictions that exist in the Commission's rules for wireless handsets in most communications services. Verizon attempts to justify these restrictive limits by arguing that "additional uplink power would be unnecessary for Consumer Boosters and only have the potential to cause harm to CMRS networks."²⁵

If implemented by the Commission, signal boosters, even at the maximum power level allowed, will still have much less transmit power than is permitted for the wireless handsets that they support and, as a result, would be no more effective than a handset in maintaining a link with a distance base station. As a result, signal boosters would no longer enhance the range and

²³ See *NPRM*, ¶ 44.

²⁴ See *Verizon/Wilson Joint Proposal* at 2; see also *id.*, Attachment A at 1.

²⁵ See *Verizon Comments* at 8.

availability of wireless broadband services, often becoming useless to consumers, especially those in rural areas where such capabilities are most needed.

A mandatory reduction in transmit power levels to 1 Watt would cause a substantial reduction in wireless broadband coverage area, reducing the reach and range of signal boosters from 7 Watts EIRP to 1 Watt in the cellular service, 30 Watts EIRP to 1 Watt in the 700 MHz CMRS band, and from 2 Watts EIRP to 1 Watt in the PCS bands. Further, the effective coverage area would decrease even further if a 1 Watt/0.05 Watt signal booster is used to support multiple handsets, each of which would be apportioned a proportionate share of both the uplink and downlink signal power.

The Verizon/Wilson joint proposal provides no explanation for the arbitrary imposition of a 1 Watt EIRP limit to all wireless services. As the Commission is aware, the signal propagation and technological capabilities of each wireless service is unique and is not susceptible to a one-size-fits-all solution.

Further, the concern that Verizon is attempting to address can be resolved far more easily using the basic technical requirements for signal boosters that are described in the opening sections of these reply comments. Specifically, Verizon is concerned that signal boosters operating at higher power levels could upset the “balanced system” of wireless networks by operating at relatively high power within close range of base station receivers.²⁶ This concern can be addressed by requiring signal boosters to reduce power or shutdown when nearing the base station of a wireless carrier. As a result, no need exists to require signal boosters to operate using maximum transmit power levels that would be very insufficient to provide utility in maintaining a reliable signal link with a distance broadband base stations.

²⁶ *See id.*

D. The Commission Should Not Impose Downlink Power Restrictions on Signal Boosters

The Verizon/Wilson joint proposal also includes significant restrictions of the power levels that signal boosters can employ when transmitting downlink signals to the handset (retransmitting the signals that the booster receives from the base station). The joint proposal seeks to restrict these power levels to 0.05 Watts, but provides no explanation or justification for this burdensome proposal.²⁷

Granted, a downlink power level of 0.05 Watts would likely be sufficient in an average house, boat or recreational vehicle. Such a downlink power level, however, would clearly be insufficient in large commercial settings, such as in a large retail store or office building.

In any event, the proposed 0.05 Watt downlink power limit is a solution in search of a problem. No party to this proceeding, including the authors to the joint proposal, has suggested that downlink transmissions by signal boosters to wireless handsets has raised any interference concerns to carriers' wireless networks, or could do so in the future. Therefore, the Commission should refrain from adopting this proposal as unnecessary.

E. The Commission Should Not Impose Arbitrary Limits on the Gain of Signal Boosters

The Joint Proposal also includes arbitrary and unnecessary limits on the gain of signal boosters, attempting to limit the gain that can be used in mobile environments to 50 dB.²⁸ Although the parties to the joint proposal do not explain this requirement, it appears to exist to

²⁷ See *Verizon/Wilson Joint Proposal* at 2; see also *id.*, Attachment A at 1.

²⁸ See *id.*, Attachment A at 2.

prevent interference between the exterior antenna of a signal booster that communicates with a base station and the interior antenna that communicates with wireless handsets.

Generally, the current state of technology does limit the gain of signal boosters used in passenger vehicles to below 50 dB. This restriction, however, requires certain assumptions regarding cable loss, the absence of frequency diversity, the directionality of antennas, and other factors. Therefore, the restriction proposed in the joint proposal may be appropriate for some signal booster designs, but may be entirely unnecessary for others.

In addition, the proposed restriction on using signal boosters with gain in excess of 50 dB is potentially relevant only to small passenger vehicles. The restriction is unnecessary in other mobile applications, such as trains, busses, trucks and boats, where the physical distance and attenuation between the interior and exterior antennas of a signal booster can be far greater.

The proposed gain restriction also ignores other technological improvements that can increase the isolation between the exterior and interior antennas, enabling the possibly use of higher gain boosters on small passenger cars in the future. For example, the use of an Interference Cancellation System could in the future enable the use of signal boosters in passenger vehicles with gains of 60 dB or more, greatly improving the covering of the signal booster while not increasing the risk of oscillation or interference. Although such an interference prevention approach would be very expensive today, the cost of this technology is likely to drop significantly in the future.

The Commission should therefore refrain from adopting restrictions that are based on arbitrary assumptions regarding the design, installation, and use of mobile signal booster. The Commission should also avoid the imposition of rules that freeze in place yesterday's technology, instead of encouraging future innovation.

F. The Commission Should Not Require Signal Boosters to be Bi-Directional

The Commission should also refrain from adopting an arbitrary and unnecessary requirement that all signal boosters be bi-directional.²⁹ This appears to be another solution in search of a problem.

As the *NPRM* clearly explains, the potential interference concerns resulting from malfunctioning or poorly designed or installed signal boosters all involve excessive transmissions from the signal booster to the base station receiver. There have been no reported complaints that we are aware of regarding interference to wireless base stations resulting from downlink signals from the booster to the handset.

Despite this fact, the joint proposal seeks to mandate that all signal boosters be bi-directional. Granted, wireless voice traffic is nearly exclusively symmetric and, as a result, there may be limited consumer demand and market opportunity for single-direction signal boosters.

Wireless data systems, however, are often asymmetric, either providing far more data to the handset (with respect to consumer applications), or providing far more data upstream to the network (with respect to remote monitoring and other machine-to-machine applications). Therefore, the Commission should be very reluctant to ban the marketing of single-direction booster devices absent a clear and unavoidable need for such a prohibition.

G. The Commission Should Reject the Micromanagement of RF Connector Types

The Commission has a long standing practice of enforcing technology neutral regulatory requirements that permit manufacturers to develop their own designs for products that satisfy the Commission's general requirements. For example, the Commission's certification rules for

²⁹ *See id.*, Attachment A at 3.

unlicensed devices require that intentional radiators be designed to ensure that no antenna other than the one furnished by the manufacturer be used with the device.³⁰ The Commission's rules give manufacturers flexibility in deciding how to comply with this requirement, often by either permanently attaching the antenna to the device, or through the use of a unique coupling.³¹

The joint proposal, however, abandons the Commission's long standing use of technical flexibility in favor of its own technically non-neutral requirement. Specifically, the joint proposal requires that signal boosters having gain in excess of 50 dB be prohibited from using FME or SMA type RF connectors and signal boosters intended for mobile applications be required to employ FME and SMA type connectors.³²

Unfortunately, the use, or non-use, of FME and SMA type connectors is anything but uniform among manufacturers of signal booster equipment. Thus, although the joint proposal may be consistent with the manufacturing practices of some of its authors, it is not consistent with other manufacturers in the signal booster market segment.

Further, as Section 15.203 of the Commission's rules clearly illustrate, micromanaging the detailed design specifications of RF connector types is unnecessary. It is instead sufficient to establish general requirements that apply equally to all signal boosters and permit equipment manufacturers to develop their own methodologies to ensure compliance.

³⁰ *See* 47 C.F.R. § 15.203.

³¹ *See id.*

³² *See Verizon/Wilson Joint Proposal, Attachment A at 2.*

H. The Commission Should Also Reject the Micromanagement of DC Input Power

Although there are likely other technologically non-neutral concerns raised by the joint proposal, the final one that Cellphone-Mate will highlight in these reply comments is the requirement that signal boosters capable of gain in excess of 50 dB be prohibited from using an input power voltage of 12 DC.³³ Obviously, the parties to the joint proposal included this requirement in an effort to prevent consumers from powering such devices using the electrical systems of cars and boats.

Car and boat batteries, however, are not the only systems that are increasingly using 12 volt DC for electrical systems. For example, portable solar panels that are marketed to the consumer market also often employ 12 volt DC to charge portable devices. The joint proposal would therefore prohibit what would likely be an innovative future product – a signal booster coupled with a 12 volt DC solar panel for use by individuals faced with emergencies in remote areas outside the normal reach of cellphone networks.

The Commission should therefore make every effort to avoid adopting regulations for signal boosters that are excessively detailed and technically non-neutral. The enforcement of requirements that attempt to micromanage this burgeoning market segment could easily stifle innovation and eliminate competition. The end result would be far fewer choices for consumers.

Instead, the Commission should adopt the targeted and transparent requirements that are identified and explained in the opening sections of these reply comments. In this manner, the Commission can ensure that wireless carriers and their networks are protected fully from harmful interference, while also providing consumers with continued access to wireless signal

³³ *See id.*

amplification equipment that can increase greatly the overall reach and reliability of voice and broadband services.

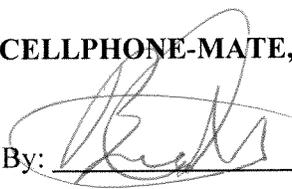
III. CONCLUSION

Cellphone-Mate supports the adoption of regulations for signal boosters that are targeted, effective, and technically neutral in their application. To this end, the Commission should enforce three requirements. All signal boosters, regardless of whether they are fixed or mobile, or use for the commercial or consumer markets, must (1) comply with the existing technical requirements for each of the wireless services, (2) employ capabilities to prevent oscillation, and (3) reduce power or shutdown when nearing the base station of a wireless carrier.

These three requirements would be sufficient to address each of the potential interference concerns that have been identified in this proceeding. At the same time, the Commission should refrain from adopting regulations that would micromanage the growing market for signal booster equipment. Many of the proposals that have been presented to the Commission in this proceeding involve excessively detailed technical requirements that would freeze innovation, impair competition, and limit choices for consumers seeking enhanced access to wireless broadband services.

Respectfully submitted,

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