Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
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	)	WT Docket No. 10-4
	)	

NOTICE OF PROPOSED RULEMAKING

Adopted: April 5, 2011 **Released: April 6, 2011**

Comment Date: (45 days after date of publication in the Federal Register)
Reply Comment Date: (75 days after date of publication in the Federal Register)

By the Commission: Commissioner Clyburn issuing a statement.

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I. INTRODUCTION

1. We initiate this proceeding to facilitate the development and deployment of well-designed signal boosters, which hold great potential to empower consumers in rural and underserved areas to improve their wireless coverage in their homes, at their jobs, and when they travel by car, recreational vehicle, or boat. Although by one measure, 99.6 percent of the nation's population is served by one or more mobile voice providers,[1] and more than 98 percent of the nation's population can now receive "advanced" or "3G" wireless services,[2] coverage gaps exist within and at the fringes of those service areas and continue to pose a problem for residents, businesses, public institutions, visitors, and public safety first responders, particularly in rural areas. Signal boosters are part of the solution to addressing coverage gaps in rural areas. Signal boosters can also mitigate service gaps in difficult-to-serve in-building environments such as in office buildings where people work, in health care facilities where doctors and other health care personnel need reliable communications, and on educational campuses where students want access to cutting edge wireless service offerings. In addition, signal boosters can provide public safety benefits, for example, by enabling the public to connect to 911 in areas where wireless coverage is deficient or where an adequate communications signal is blocked or shielded.

2. The regulatory framework for signal boosters proposed in this *Notice of Proposed Rulemaking* (*NPRM*) is one element in a set of initiatives designed to promote deployment of mobile voice and broadband services in the United States. Well-designed, properly operating, and properly installed signal boosters have the potential to improve consumers' wireless network coverage without harming commercial, private, and public safety wireless network performance. Malfunctioning, poorly designed, or improperly installed signal boosters, however, may harm consumers by blocking calls, including E-911 and other emergency calls, and decreasing network coverage and capacity. The regulatory framework proposed in this *NPRM* seeks to create appropriate incentives for carriers and manufacturers to collaboratively develop robust signal boosters that do not harm wireless networks. This, in turn, will enable consumers to improve their cell phone coverage as they deem necessary. The public interest is best served by ensuring that consumers have access to well-designed boosters that do not harm wireless networks.

3. The *NPRM* proposes a new regulatory framework authorizing individuals and entities to operate "consumer signal boosters"[3] provided the devices comply with: (1) all applicable technical and radiofrequency (RF) exposure rules, and (2) a set of parameters aimed at preventing and controlling

[1] In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, 2010 FCC LEXIS 3186 at ¶ 44. Commission estimates are based on American Roamer Data. *Id.*

[2] *Id.* at ¶ 47. Advanced wireless services include both voice telecommunications service as well as e-mail and Internet access.

[3] We define the term "consumer signal booster" in this *NPRM* to include any signal booster operated by (or for the benefit of) consumers on spectrum being used to provide subscriber-based services, *e.g.,* voice communications, texting, using a broadband connection to access e-mail or the Internet.

interference and rapidly resolving interference problems should they occur. We also propose revisions to the rules governing signal boosters used for private land mobile services.

II. EXECUTIVE SUMMARY

4. In this proceeding, we propose to amend Parts 1, 2, 22, 24, 27, 90, and 95 of our rules to adopt new technical, operational, and coordination parameters for fixed and mobile signal boosters.[4] In the *NPRM* below, we address three petitions for rulemaking filed by Bird Technologies, Inc. (Bird Technologies),[5] the DAS Forum (a membership section of PCIA – the Wireless Infrastructure Association) (DAS Forum),[6] and Wilson Electronics, Inc. (Wilson),[7] and a petition for declaratory ruling filed by Jack Daniel DBA Jack Daniel Company (Jack Daniel),[8] all of which relate to signal boosters.

5. In our *NPRM*, we propose to authorize individuals to use fixed and mobile consumer signal boosters by rule under Part 95 subject to the requirements listed in Table 1 below. The proposed rules would not apply to femtocells.[9]

[4] Our use of the term "signal booster" in this *NPRM* is 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. Our use of the term "signal booster" does not include femtocells.

[5] Bird Technologies Group Petition for Rulemaking, filed Aug. 18, 2005 (Bird Technologies Petition).

[6] DAS Forum Petition for Rulemaking, filed Oct. 23, 2009 (DAS Forum Petition).

[7] Wilson Electronics, Inc. Petition for Rulemaking, filed Nov. 3, 2009 (Wilson Petition).

[8] Petition for Declaratory Ruling of Jack Daniel DBA Jack Daniel Company, filed Sept. 25, 2008 (Jack Daniel Petition). CTIA, the Wireless Association (CTIA) also filed a Petition for Declaratory Ruling relating to signal boosters. Petition for Declaratory Ruling of CTIA - the Wireless Association, filed November 2, 2007 (CTIA Petition). The CTIA Petition remains pending.

[9] Femtocells are different from signal boosters. Femtocells are similar to small base stations inside homes or offices and only work in a carrier's licensed area. The connection between the handset and the femtocell is typically wireless using licensed frequencies or Wi-Fi, which uses unlicensed frequencies. Unlike signal boosters, which connect to a wireless network using licensed frequencies, femtocells connect to a wireless network using broadband Internet access in a home or office. Femtocells are not covered by the rules proposed in this NPRM.

TABLE 1

Requirements		Fixed Signal Boosters	Mobile Signal Boosters
Comply with technical parameters (*e.g.*, power and unwanted emission limits) for the applicable spectrum band, and RF exposure requirements for the type of device (*i.e.*, fixed or mobile)	*Manufacturers*	●	●
Automatically self-monitor operations and shut down if not in compliance with our technical rules		●	●
Power down, or shut down, automatically when a device is not needed, such as when the device approaches the base station with which it is communicating			●
Market and label consumer signal boosters in a way that provides consumers with clear information specifying the legal use of the devices		●	●
Upon notification, immediately cease operation in the event the device causes harmful interference to wireless network operations	*Operators*	●	●
Coordinate frequency selection and power levels with the applicable wireless carrier(s) prior to operation		●	

- Seek comment on whether to require registration with a national signal booster clearinghouse prior to operation.
- Seek comment on the treatment of existing signal boosters.
- Facilitate the near-term availability of new, compliant consumer signal boosters by:
    - within 30 days of the effective date of the rules, requiring that all applications for equipment authorization for signal boosters demonstrate compliance with the new rules; and,
    - within 6 months of the effective date of the rules, requiring that devices marketed or sold in the United States comply with the new rules.
- With respect to Part 90 Private Land Mobile Radio (PLMR), non-consumer signal boosters operated by licensees, revise the technical and operational requirements aimed at preventing interference.

III. BACKGROUND

6. *Signal Booster Basics.* Signal boosters are signal amplifiers that can be deployed in many

different configurations to improve the wireless connection between a mobile device and the wireless network. Signal boosters are often used to amplify and distribute wireless signals to areas with poor signal coverage and can expand the area of reliable service to unserved or weak signal areas, including garages, underground transportation systems, and large buildings. Two key variables affect the quality of a wireless connection. The first variable is distance to the nearest cell site or base station. In general, the farther away a cell phone is moved from a cell site, the weaker the signal. The second variable is any physical obstacle between the cell phone and the base station. Natural and man-made obstacles, including terrain and buildings, can block the radio frequency waves which form the communications link between a cell phone and a base station. In addition, metal, glass, and foliage, while not entirely blocking a signal, can attenuate or reduce the signal.[10] Poor quality signals can lead to dropped calls, slower data speeds, and depleted battery life.

7. *Fixed Signal Boosters*. Fixed signal boosters facilitate the use of mobile devices inside homes, buildings, and other structures, such as sports arenas,[11] by amplifying or distributing signals within the structure that would otherwise be too weak to achieve communications. A basic fixed signal booster can serve a single room in a house, while an enhanced booster can serve a multistory building. A typical fixed signal booster configuration includes an outside antenna installed on a roof or side of a building. The outside antenna is connected via coaxial cable to an interior amplifier, which either has a built-in antenna or is connected to one or more interior panel antennas that permit communication with mobile devices in the structure.

8. A distributed antenna system (DAS) is a system of spatially separated antennas connected via cables (*i.e.,* coaxial or fiber optic cable) to a signal source, such as a base station or an external antenna capable of communicating with a base station wirelessly. DAS are used to distribute wireless signals through large structures such as skyscrapers, hospitals, hotels, arenas and tunnels where the signal coverage may be lacking or to increase the capacity of the wireless system by achieving channel reuse on a smaller scale. Some DAS configurations may be considered signal boosters when the network of internal antennas achieves communication through the use of an amplifier that is connected to an external antenna that communicates with a base station wirelessly.

9. *Mobile Signal Boosters*. Typically, mobile signal boosters transmit and receive wireless signals to and from a cell phone operated inside a vehicle (*e.g.,* car, boat or RV). A typical mobile signal booster installation consists of an outside antenna attached to the roof of a vehicle, which is connected using coaxial cable to an amplifier and an inside antenna. Depending of the manufacturer and model, a cell phone can connect to the mobile signal booster using an antenna adapter that connects directly to the wireless device, a docking "cradle," or wirelessly.

IV. NOTICE OF PROPOSED RULEMAKING

A. Introduction

10. In this *NPRM,* we seek comment on rules and policies that will broaden the availability and use of signal boosters to enhance wireless coverage for consumers, particularly in rural and underserved areas, while ensuring that boosters do not adversely affect wireless networks. The new framework proposed in this *NPRM* is one in a set of Commission initiatives designed to promote deployment of mobile voice and broadband coverage across America.

11. Signal boosters serve the public interest by enabling consumers to improve their wireless

[10] *Ex Parte* Letter from Russell D. Lukas to Marlene H. Dortch, Secretary, Federal Communications Commission (May 12, 2010), Attachment *In-Car Cellular Signal Boosters, White Paper Prepared for: Wilson Electronics* at 2.

[11] Femtocells are different from signal boosters and are not covered by the rules proposed in this NPRM.

coverage in rural, underserved, and difficult to serve areas. Signal boosters can also address coverage gaps in urban environments such as buildings, tunnels, and garages. Signal boosters can benefit consumers by improving wireless coverage in office buildings where they work, in health care facilities, where health care providers need reliable communications, and on educational campuses were students want access to cutting edge wireless offerings. By bridging gaps in wireless carriers' coverage areas, signal boosters may also give consumers, particularly rural consumers, additional choices among wireless providers. Such increased competition may benefit consumers through lower prices and increased variety in service offerings. In addition, facilitating the use of signal boosters in rural and other areas of America will further our strategic goal of promoting broadband development, deployment, and availability.[12] The relatively low-cost, coverage enhancing features of signal boosters will thus help many Americans to enjoy the dynamic growth in the variety and quality of wireless service offerings.

12. Signal boosters also provide public safety benefits. In areas where wireless coverage is deficient or where a signal is blocked or shielded, signal boosters enable the public to connect to 911 in an emergency.[13] We note that both rural and metropolitan police departments rely on signal boosters to extend land mobile coverage in areas of limited service.[14] First responders, including emergency medical personnel, also use signal boosters to improve communications during disasters and other emergencies.[15]

13. Malfunctioning, improperly installed, or technically deficient signal boosters, however, may cause harmful interference to commercial and public safety wireless networks. Interference could disrupt calls or even cause calls to be dropped, including 911 emergency assistance calls, and might cause loss of service in a cell site sector. The record before us reflects that wireless service providers and public safety

[12] Federal Communications Commission Strategic Plan 2009 – 2014 at 5, *available at* http://www.fcc.gov/omd/strategicplan/#goals (last visited Aug. 24, 2010).

[13] In May 2009, the National Transportation Safety Board recommended that until wireless capacity is extended along highly traveled rural roads, motorcoaches traveling in rural areas without wireless telephone coverage should carry mobile cellular amplifiers or satellite-based devices to communicate during emergency events. NTSB Safety Recommendation, H-09-9, at 4-5 (May 29, 2009), *available at* http://www.ntsb.gov/Recs/letters/2009/H09_9.pdf (lasted visited July 19, 2010). *Ex Parte* Letter from Russell D. Lukas, Counsel to Wilson Electronics, Inc. to Hon. Julius Genachowski, Chairman, Federal Communications Commission (Mar. 30, 2011) at 2 (describing how use of signal boosters will improve E911 connectively and accuracy).

[14] *See, e.g., Ex Parte* Letter from Russell D. Lukas, Counsel to Wilson Electronics, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (Dec. 15, 2010) at Attachment 1 (Wilson December 15, 2010 *Ex Parte* Letter) (describing need for signal boosters by Sheriff's office in rural Washington County, Utah, because many areas of the county lack two-way radio signal coverage due to challenging geography and terrain); Orange County Sheriff-Coroner Department Comments at 1 (bi-directional amplifier systems "supplement in-building two way public safety radio communications coverage where it wouldn't otherwise exist or would be unreliable"); Cobb County E-911 Comments at 1 ("great and positive" benefits of signal boosters include "ability to provide critical or important communications where there is limited or none"). *See also* New York City Transit Authority Reply Comments at 2 (NYCTA uses fixed boosters for police, fire and EMS operations in New York's underground subway system); Joint Council on Transit Wireless Communications Comments at 1-2 (signal boosters are "essential components" to most transport operators to enable "vital communications" within tunnels, underground facilities, and buildings).

[15] *See, e.g.,* APCO Comments at 1 ("signal boosters are extremely valuable to public safety networks"); Wilson December 15, 2010 *Ex Parte* Letter at Attachment 1 (Christopher Andrews, Wilson County Emergency Management, Tennessee (noting the need for signal boosters in emergency response vehicles in order to serve rural areas); Karen Kempert, Emergency Manager/911 Systems Coordinator, Langdon, ND (describing the use of a signal booster to facilitate communications on a search and rescue operation in an area of challenging terrain); John Thompson, Flagstaff, AZ (stating that "[s]ignal amplifiers are essential for rural emergency responders and rural residents" both on and off Navajo reservations).

communications officials often spend many hours and significant resources to locate and eliminate signal booster related interference. The new regulatory framework we propose today will allow consumers to realize the benefits of using signal boosters while preventing, controlling, and, if necessary, resolving interference to wireless networks.

1. Problems Encountered with Signal Boosters

14. Poorly designed, improperly installed or malfunctioning signal boosters can cause interference to both commercial and public safety wireless networks. Signal boosters can produce "noise,"[16] which has the potential to interfere with wireless networks. This "noise" can take the form of adjacent channel interference, oscillation, or base station receiver overload, which are explained below.

15. *Adjacent Channel Noise (The "Near-Far" Problem)*. One "noise" problem that can be created by signal boosters occurs when a subscriber is far from the carrier's base station that provides its service, but near a different wireless carrier's base station that is using an adjacent frequency block. Many signal boosters are wideband and will amplify any signal within the frequency range or "passband"[17] of the signal booster filter, which could include all of the carriers providing service in that area. Therefore, while the wideband booster would benefit the subscriber installing it, because it will amplify the subscriber's weak signal to a level necessary to achieve communication, it could also harm an adjacent carrier because the booster is amplifying signals or creating noise on the adjacent spectrum block where it is not needed or desired. This scenario is more problematic for wideband mobile signal boosters because a signal booster could be operating with maximum amplification to assist carrier "A's" subscriber with a weak signal while driving by carrier "B's" base station, generating sufficient noise for carrier B's base station to drop communications with its subscribers that may be operating at the fringes of carrier B's base station's coverage area.[18] Higher power signal booster operation can thus create the potential for adjacent-channel interference to other wireless carrier's base stations that may be nearby if the device is not properly installed or not operating with appropriate safeguards.

16. *Oscillation*. Another type of "noise" signal boosters can create is oscillation (feedback). Oscillation occurs when the signal from the internal antenna of a signal booster reaches the external antenna of the device and generates uncontrollable high level signals.[19] Oscillation can interfere with both the signal from the base station to the wireless device as well as the signal from the wireless device to the base station. As a result, the licensee as well as others operating within the passband frequencies of the signal booster may experience interference. To avoid oscillation, antennas require attenuation (isolation), *i.e.,* vertical and horizontal spacing between the antennas.[20]

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[16] In radio communications, "noise" refers to any unwanted electro-magnetic energy or signal that degrades or obstructs the desired signals.

[17] The passband is the frequency range which the signal booster is designed to amplify.

[18] Digital modulation techniques, especially Code Division Multiple Access (CDMA) rely upon power control of the subscriber units for efficient use. The network will monitor the received power of the subscriber units and send command signals to increase or lower transmitter power to ensure that all subscriber signals arrive at the base stations with similar power levels. If one subscriber signal is too strong, it reduces the capacity of the system and may result in the base station dropping calls from subscribers that are further away from the base station; this is called cell shrinkage.

[19] This is similar to the noise created when a microphone is placed too close to a speaker.

[20] AT&T explains that its Global System for Mobile Communications (GSM) network interprets an oscillating signal booster signal as external noise and as a result, the network electronically instructs all cell phones being served by that sector to increase power in an effort to overcome the perceived noise. AT&T further explains that this action effectively constricts the coverage of the affected cell site section, which causes cell phones to drop calls (continued….)

17. *Base Station Receiver Overload*. Most wireless networks employ dynamic power control to maximize network capacity. Power control operates by precisely adjusting the power of the base stations and handsets within the network to achieve the optimal signal level for reliable communications. Power control minimizes interference, maximizes handset battery life, and increases the life span of base transceiver station power amplifiers.[21] Typically, signal boosters are not dynamically controlled by the network and thus may continue to amplify a handset's signal even when it is not needed, which may overload the base station. This can apply both to mobile signal boosters that can travel close to a different carrier's base stations, as well as fixed signal boosters that are not coordinated with the carriers that the booster is capable of affecting. In addition, signal boosters create unique issues for Code Division Multiple Access (CDMA) networks. In a CDMA system, to maximize network capacity, wireless carriers use power control to ensure that the received power of all subscribers at the base station is at the minimum level needed for reliable communications. The presence of a signal booster within the power control loop of a CDMA system can increase the received power of a subscriber at the base station, which would affect the power control operation of all wireless devices being served by that base station. As a result, the base station receiver may not be able to operate as efficiently as designed, could drop some calls, or could be overloaded,[22] adversely affecting the coverage and capacity of the serving base station as a whole.

18. *Public Safety/Sprint Nextel Issue.* Use of signal boosters in the 800 MHz spectrum band raises additional issues because in many markets, public safety channels are still interleaved with Specialized Mobile Radio (SMR) channels that are used by Sprint Nextel and others. Sprint Nextel describes a typical problem which involves the use of 800 MHz wideband signal boosters to improve coverage of public safety signals inside buildings.[23] Specifically, if the installation of an in-building public safety signal booster system is not coordinated with Sprint Nextel and others that use the 800 MHz band commercially, the in-building systems may overload nearby commercial base stations resulting in dropped calls and reduced network capacity. Sprint Nextel states that, "[i]nterference to commercial networks harms consumers by increasing costs, decreasing quality, and consuming limited human and financial capital resources."[24] Jack Daniel also states that interference from Class B Signal Boosters[25] poses a problem to both Sprint Nextel and public safety licensees authorized to use the 806-821 MHz and

(Continued from previous page)
and lose coverage. In addition, AT&T notes that this action reduces battery life of the signal booster user's own phone as well as the cell phones of other subscribers whose phones automatically increase power to overcome the interference caused by the signal booster. AT&T Comments at 26-27.

[21] A base transceiver station power amplifier amplifies signals at the base station before they are transmitted through the antenna.

[22] Overload occurs when a receiver is unable to reject excessive energy outside its intended frequency band of operation.

[23] Sprint Nextel Comments at 3. Sprint Nextel explains that because many communities require building owners to ensure that public safety communications can be received throughout a building, building owners often install in-building signal booster systems. Sprint Nextel further explains that these systems tend to cover the entire 800 MHz band to ensure that multiple public safety channels will be available in the building. As a result, Sprint Nextel states that these boosters will amplify all signals in the band whether needed or not. *Id.*

[24] *Id.* at 8.

[25] For the reasons discussed below (*see infra* ¶¶ 71-74), our Part 90 rules create regulatory distinctions between Class A (narrowband) and Class B (wideband) signal boosters. Class A signal boosters amplify only those discrete frequencies intended to be retransmitted, while Class B signal boosters amplify all signals within the passband of the signal booster filter. 47 C.F.R. § 90.7. Our CMRS rules in Parts 22, 24, and 27 do not contain a similar regulatory distinction.

851-866 MHz frequency bands, and that signal booster installations must be coordinated with the appropriate licensees.[26]

19. *E-911 Issue.* The use of signal boosters also presents challenges for certain network-based Enhanced 911 (E-911) systems.[27] Some E-911 systems use positioning technologies to determine a mobile phone's location by comparing the times at which a cell signal reaches multiple Location Measurement Units ("LMUs") installed at the operator's base stations. Sometimes LMUs pick up both a boosted signal and the original handset signal, which are at different strengths, and may lead to inaccurate location estimates for the person using a booster.

20. *Comments*. A number of public safety commenters note that signal boosters have caused interference to public safety operations.[28] The Massachusetts State Police, for example, note an average of 10 instances of interference per year to their public safety networks, which they attribute to signal boosters.[29] The Orange County Sheriff-Coroner Department states that it encounters interference due to signal boosters regularly and spends approximately 300 hours and $25,000 each year addressing interference events.[30]

21. Commercial mobile radio service providers similarly report instances of interference caused by signal boosters.[31] Verizon Wireless, for example, states that signal booster interference to its network has ranged from degrading a single digital channel on a single cell sector, to degrading multiple channels on multiple cell sites, leading to a reduction in the coverage area of a cell sector, to shutting down channels, sectors, or cell sites entirely.[32] Sprint Nextel describes tracking an interfering signal booster as a game of "cat and mouse" where employees sometimes drive for hours to identify the source of interference.[33] U.S. Cellular states that one episode of interference required an engineer to spend four weeks and 60 hours tracking down the cause.[34] AT&T details an incident where a mobile signal booster on a yacht caused substantial interference to "six AT&T towers in Florida, lasted for 21 hours, and led to 2,795 dropped calls and 81,000 blocked or impaired calls" because the signal booster came too close to the cell towers.[35] AT&T also notes how signal booster interference results in an increasing percentage of

[26] Jack Daniel Reply Comments at 3.

[27] The FCC's wireless E-911 rules seek to improve the effectiveness and reliability of wireless 911 services by providing 911 dispatchers with additional location-specific information on wireless 911 calls. Wireless carriers may meet their E-911 requirements by installing location capability in individual subscriber handsets (handset-based E-911 system) or deploying location capability in the carrier's network (network-based E-911 system).

[28] *See, e.g.,* Massachusetts State Police Comments at 1; King County, Washington Regional Communications Board Comments at 1-3; San Bernardino County Comments at 1.

[29] Massachusetts State Police Comments at 1.

[30] Orange County Sheriff-Coroner Department Comments at 2. *See also* Cobb County E-911 Comments at 1-2 (Cobb County states that there are poorly designed and manufactured, disposable signal boosters on the market, and that "it only takes one malfunctioning device to hamper communications for all.").

[31] AT&T Reply Comments at 10. *See also* Verizon Wireless Comments at 6-8; U.S. Cellular Comments at 5-6; Sprint Nextel Comments at 4.

[32] Verizon Wireless Comments at 6.

[33] Sprint Nextel Comments at 3.

[34] U.S. Cellular Comments at 7.

[35] AT&T Comments at 30-31.

dropped calls, loss of coverage, and reduced cell phone battery life.[36]

2. Petitions Filed

22. Three parties (Bird Technologies, the DAS Forum, and Wilson Electronics) filed Petitions seeking changes to our rules to address the proper use and regulation of signal boosters. In addition, Jack Daniel filed a petition for declaratory ruling seeking clarification of the Commission's rules regarding Part 90 signal boosters. The Petitions were placed on Public Notice for Comment on January 6, 2010.[37] Comments and reply comments were due on February 5 and March 8, 2010, respectively.[38] The Petitions are briefly described below.

23. On October 23, 2009, the DAS Forum filed a Petition for Rulemaking stating that a rulemaking proceeding is needed to address the marketing, installation, and operation of Commercial Mobile Radio Service (CMRS) signal boosters. It urges us to explore the best methods for resolving interference issues without resorting to regulations that unnecessarily inhibit the sale and installation of signal boosters or that may hinder market innovations. The DAS Forum submits a proposed Industry Code of Conduct as a foundation for the development of rules to address the marketing and use of signal boosters and states that this Code can be easily incorporated in or cross-referenced by the Commission's rules.[39]

24. On November 3, 2009, Wilson Electronics filed a Petition for Rulemaking asking the Commission to commence a proceeding to amend Part 20 of our rules to establish standards for the certification of signal boosters for subscriber use on CMRS networks by developing equipment certification requirements to ensure boosters are available to the public. Wilson states that the Commission, as opposed to wireless service providers, should adopt equipment certification requirements to ensure that signal boosters will not cause interference to network operations.[40]

25. On August 18, 2005, Bird Technologies filed a Petition for Rulemaking to amend section 90.219 of the Commission's rules to outline specific technical and operational requirements for the use of signal boosters by Part 90 licensees. Bird Technologies suggests that signal boosters should only be used with the full knowledge of licensees.[41]

26. On September 25, 2008, Jack Daniel filed a Petition for Declaratory Ruling seeking clarification of the operational and technical limits that apply to Part 90 Class B wideband signal boosters under the Commission's rules.[42] Specifically, Jack Daniel requests a declaration confirming the following five "elements" which he asserts are the "totality of the Commission's decisions regarding the

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[36] *Id.* at 26-27.

[37] Wireless Telecommunications Bureau Seeks Comment on Petitions Regarding the Use of Signal Boosters and Other Signal Amplification Techniques Used With Wireless Services, *Public Notice,* 25 FCC Rcd 68 (Jan. 6, 2010) (*Signal Boosters Public Notice*).

[38] Wireless Telecommunications Bureau Extends Period to File Reply Comments on Petition Regarding the Use of Signal Boosters and Other Signal Amplification Techniques Used With Wireless Services, *Public Notice*, 25 FCC Rcd 1437 (Feb. 18, 2010).

[39] DAS Forum Petition at 6-8.

[40] Wilson Petition at iii.

[41] Bird Technologies Petition at 6-8.

[42] We deny the Jack Daniel Petition for Declaratory Ruling. Jack Daniel's requests for clarification are in fact requests for rule changes. We invite comment on those proposals as set forth below. *See, e.g., infra* at ¶¶ 73, 75, 77, 82-83, 88, 90.

deployment and use of Class B signal boosters": (1) Class B boosters may be operated by licensees to extend or improve reliable communications; (2) Class B boosters may only be deployed in confined locations or remote locations; (3) Class B booster power is limited to 5 watts ERP per channel; (4) operators of Class B boosters are responsible for eliminating all interference caused by operation; and (5) no license is required for the operation of these devices.[43] In addition, Jack Daniel asks us to declare that we do not intend to regulate Part 90 Class B signal boosters in a manner which would inhibit local governments and public safety entities from mandating in-building signal booster deployment to improve wireless coverage.[44]

B. Certification and Use of Consumer Signal Boosters

27. Our goal in this proceeding is to facilitate the development and deployment of well-designed signal boosters that do not interfere with wireless networks. The record reflects that there is a genuine need for signal boosters to enhance commercial wireless networks.[45] Commenters explain that signal boosters can be a valuable tool to extend wireless coverage in rural areas where network buildout may be sparse or in areas where natural or man-made barriers physically impede signal coverage.[46] Commenters also state that the use of properly designed and installed signal boosters will allow consumers to place emergency calls and other calls in areas of weak or limited coverage.[47] Moreover, commenters maintain that robust signal boosters can be designed, which would not impair network reliability.[48]

28. Accordingly, as explained in more detail below, we propose to authorize individuals and entities to operate consumer signal boosters in spectrum being used to provide subscriber-based service

[43] Jack Daniel Petition at 3.

[44] *Id.* at 9-11.

[45] *See, e.g.,* Wilson December 15, 2010 *Ex Parte* Letter at Attachment 1 (Letter from Jeff Guengerich, Operations Manager, Yellowstone Park Service Stations, Inc. (Nov. 29, 2010) (tow truck operator noting safety and traffic control benefits from signal boosters in remote national parks where additional cell towers will not be constructed); Cranford Jordan, Winn Parish Fire Chief, Louisiana (noting need for signal boosters to obtain adequate communications signals for fire rescue operations in rural Louisiana); Stan Morgan, Logan, WV (stating the signal boosters were necessary for communications during a mining accident in Montcoal, WV); Dietrich Gravenstein, MD, Gainesville, FL (stating that he relies on a signal booster to receive wireless service in his home and noting the particular importance for him as a doctor "on call")); Wayne Klingelsmith Comments at 1 (discussing importance of signal booster use in hospitals where staff rely on cell phones to respond to critical patient care issues); George Udvary Jr. Comments at 1 (discussing necessary use of signal boosters coupled with cellular modems to provide essential telemetry functions for remote solar energy installations); Donald Bigelow Comments at 1 (rural homeowner noting benefits of boosters in weak signal areas); Todd Van Dussen Comments at 1 (discussing use of signal boosters by oil field workers). Wilson states that it has sold more than two million amplifiers and antennas since 2001 and 150,000 amplifiers in 2008. Wilson Petition at 4. Similarly, Wi-Ex notes rapid sales growth for its signal boosters. Wi-Ex Reply Comments at 8.

[46] *See, e.g.,* CTIA Reply Comments at 13 ("authorized boosters can be an important tool in delivering mobile wireless service to building and rural areas"); Sprint Comments at 1 ("[p]roperly designed and installed, signal boosters can aid wireless subscribers by expanding the usability of wireless networks in areas of poor signal coverage")..

[47] *See, e.g.* ,Wilson Petition at 1-2; Smart Booster Comments at 42.

[48] *See, e.g.* Wilson Petition at 13-17; Smart Booster Comments at 23-49. *See also Ex Parte* Letter from Russell D. Lukas, Counsel to Wilson Electronics, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (Dec. 16, 2010) (Wilson Dec. 16, 2010 *Ex Parte* Letter) at Attachment 1 (describing testing of Wilson signal boosters by Canadian carrier, TELUS Mobility, and noting that multiple Canadian carriers sell Wilson boosters to their subscribers).

provided the devices fully comply with (1) all applicable technical and RF exposure rules, and (2) a set of parameters crafted to prevent and control interference and rapidly resolve interference should it occur.[49] We believe that our proposed regulatory framework will empower consumers to expand coverage without compromising network reliability and thus serve the public interest.[50] Consumers will benefit from expanded mobile voice and data coverage in rural areas[51] and added reliability in areas that are technically difficult to serve such as tunnels, parking garages, and underground transportation systems. Consumers will also benefit from increased access to innovative wireless broadband services. Moreover, any increased potential for harmful network interference can be addressed by the specific measures we propose to control, prevent, and, if necessary, resolve harmful interference. We seek detailed comment on the text of proposed rule sections 95.1601 *et seq*.[52]

1. License-by-Rule Framework

29. We propose to license the use of signal boosters by rule under Section 307(e) of the Communications Act.[53] That provision states in part that, "[n]otwithstanding any license requirement established in this Act, if the Commission determines that such authorization serves the public interest, convenience, and necessity, the Commission may by rule authorize the operation of radio stations without individual licenses in the following radio services: (A) citizens band radio service; …"[54] Section 307(e) states further that, "[f]or purposes of this subsection, the terms 'citizens band radio service', … shall have the meanings given them by the Commission by rule."[55] We believe that a license-by-rule framework would be the best approach for enabling operation of properly certificated signal boosters, particularly because it would obviate the need for burdensome individual licensing requirements. Our proposed regulatory framework would facilitate operation of signal boosters to enhance wireless coverage and access to broadband services, while minimizing administrative costs and burdens on the public, Commission licensees, and agency staff, thus serving the public interest, convenience and necessity.

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[49] Although our rules proposed here would apply to Part 90 subscriber-based services, at this time, we do not propose that they would apply to Part 90 private land mobile radio (PLMR) services. Signal booster use for PLMR services is addressed below. *See infra* ¶¶ 67-96.

[50] *See, e.g.,* Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, *Report and Order and Further Notice of Proposed Rulemaking*, 11 FCC Rcd 18676, 18692-99 ¶¶ 29-46 (1996) (significant public interest benefits were served by requiring wireless carriers to automatically forward all 911 calls, including non-subscriber calls, to public safety answering points despite concerns regarding increased costs which could have a negative effect on levels of service and overall competition). Some commenters question whether certification standards are sufficient to protect wireless networks. AT&T, for example, states that certification standards do not provide wireless carriers with sufficient control to ensure the integrity and optimal functioning of their networks. AT&T Reply Comments at 42. Similarly, Sprint Nextel states that a "generic equipment authorization decision, even one ostensibly backed by normative standards" cannot "address the myriad ways in which signal boosters can disrupt complex, wide area network operations." Sprint Nextel Comments at 7. Verizon Wireless adds that device features alone are insufficient to address carrier interference concerns. Verizon Wireless Comments at 14-15.

[51] Wilson Electronics conducted drive testing in four states – Nevada, Utah, Arizona, and New Mexico – and states that its Sleek signal booster "improved the signal strength of the phones used during the test in more than 15% of the area covered for Verizon phones, and more than 25% of the areas covered for the Sprint phones." Wilson Dec. 16, 2010 *Ex Parte* Letter at Attachment 1.

[52] The full text of proposed rule sections 95.1600 *et seq.* is set forth in Appendix A below.

[53] 47 U.S.C. § 307(e).

[54] 47 U.S.C. § 307(e)(1).

[55] 47 U.S.C. § 307(e)(3).

30. The Commission's authority to license new services by rule under Section 307 is well established.[56] Under this approach, we adopt a set of rules that prescribe parameters of operation, and individuals may operate facilities to provide the service in any manner within those parameters. Indeed, the Commission has licensed an array of beneficial services by rule by defining the Citizens Band Radio Services to also include the Family Radio Service (FRS), the Low Power Radio Service (LPRS), the Medical Device Radiocommunication Service (MedRadio), the Wireless Medical Telemetry Service (WMTS), the Multi-Use Radio Service (MURS), and the Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs).[57]

31. We tentatively conclude that authorizing the operation of properly certificated signal boosters by rule under Section 307(e) of the Act would further the public interest, convenience, and necessity. As explained above, signal boosters provide substantial public benefits for consumers by improving wireless coverage in rural, indoor, and other hard to serve locations where wireless coverage may be deficient. We are mindful that we propose to authorize operation of signal boosters on licensed spectrum. We thus propose that any such use would be on a secondary, non-interfering basis, and would have to meet our proposed technical parameters of operation, which are designed to prevent, control, and quickly resolve any interference should it occur.

32. Accordingly, we propose to establish a new Signal Booster Radio Service under Part 95 of the Commission's Rules, and define it as a Citizens Band Radio Service pursuant to the Commission's authority under Sections 307(e)(1) and (e)(3) of the Act. We seek detailed comment on our proposed license-by-rule framework, including whether this framework would provide the most beneficial approach for enabling operation of signal boosters. In the alternative, we query whether it would be more appropriate to authorize signal booster use under existing carrier licenses, akin to the authorization for subscriber equipment (*e.g.,* handsets), under our current rules.[58] Such an approach could be accomplished by modifying section 1.903(c) of our rules to authorize the use of properly certificated fixed and mobile signal boosters by subscribers and non-subscribers. We seek comment on this or any other alternative regulatory approach for authorizing signal booster use. Commenters that support an alternative regulatory framework, such as the one we suggest above, should explain in detail how an alternative approach would be structured, its legal basis, and its relative costs and benefits.

2. General Requirements For All Consumer Signal Boosters

33. Under our proposal, subscribers, particularly rural subscribers, will benefit from the ability to use compliant signal boosters. We find it is appropriate that such devices meet stringent technical and operational requirements to prevent, control and, if necessary, resolve adverse impacts on wireless networks. We seek to ensure that signal boosters operated pursuant to our proposal do not cause harmful interference to the wireless network. Specifically, operation of signal boosters should not adversely affect network reliability, operation, or management. Consistent with this important goal, we propose a number of safeguards for manufacturers and operators to govern the manufacturing, marketing, and operation of all consumer signal boosters.

34. *Manufacturing Requirements.* We propose that all consumer signal boosters must meet all applicable technical specifications for the relevant band(s) of operation as they apply to mobile units (*i.e.,*

[56] *See, e.g.,* Amendment of Parts 1 and 95 of the Commission's Rules to Eliminate Individual Station Licenses in the Remote Control (R/C) Radio Service and the Citizens Band (CB) Radio Service, PR Docket No. 82-799, *Report and Order*, 48 Fed. Reg. 24884 ¶ 25 (1983).

[57] *See* 47 C.F.R. §§ 95.401(a)-(g).

[58] *See* 47 C.F.R. § 1.903(c).

not base station technical specifications).[59] Although Parts 22, 24, and 27 of our rules do not provide specific technical requirements for signal boosters, all subscriber or mobile devices certified to operate under those rule parts must meet specific technical requirements. For example, all certified devices must comply with the specified power levels for their applicable rule parts.[60] Likewise, certified devices must comply with specified out-of-band emissions (OOBE) limits.[61] In addition, Part 22 devices are subject to frequency tolerance limits.[62]

35. Unlike Parts 22, 24, and 27 of our rules, Part 90 specifies technical parameters for certain signal boosters and signal repeaters. For example, narrowband (Class A) signal boosters must be equipped with automatic gain control circuitry, which will limit the total effective radiated power (ERP) of the unit to a maximum of 5 watts and wideband (Class B) signal boosters must be limited to 5 watts ERP for each authorized frequency that the booster is designed to amplify.[63] In addition, Part 90 narrowband boosters must meet the OOBE limits listed in this part for each narrowband channel that the booster is designed to amplify.[64] Similarly, Class B signal boosters must meet the emission limits listed in this part for frequencies outside of the booster's designed passband.[65] Part 90 also limits mobile repeater stations to a maximum output power limit of 6 watts.[66] Requiring signal boosters to be manufactured to meet all applicable technical requirements is the cornerstone of promoting access to such devices while minimizing the potential for harmful interference. We seek detailed comment on our proposal and proposed rule language contained in Appendix A that signal boosters must comply with all applicable technical requirements for mobile units for the bands they will operate on. In addition, we seek comment on whether any other technical specifications should apply and the costs and benefits of adopting such additional technical requirements.

36. We also propose that signal boosters must automatically self-monitor their operations to

[59] The applicable rules are § 22.355, Public Mobile Services frequency tolerance; § 22.913, Cellular effective radiated power limits; §22.917, Emission limitation for cellular equipment; § 24.232, PCS power and antenna height limits; § 24.238, Emission limitations for Broadband PCS equipment; § 27.50, Miscellaneous Wireless Communications Services power and antenna height limits; § 27.53, Miscellaneous Wireless Communications Services emission limits; § 90.205, Private Land Mobile Radio Services power and antenna height limits; § 90.210, Private Land Mobile Radio Services emission masks; § 90.219, Private Land Mobile Radio Services use of signal boosters; and § 90.247, Private Land Mobile Radio Services mobile repeater stations.

[60] *See, e.g.,* 47 C.F.R. § 22.913(a)(2) (maximum power level for cellular devices can be no greater than 7 watts ERP); 47 C.F.R. § 24.232(c) (maximum power level for PCS devices can be no greater than 2 watts EIRP); 47 C.F.R. § 27.50(d)(2) (maximum power level for AWS devices can be no greater than 1 watt EIRP).

[61] *See, e.g.,* OOBE limits for Cellular, 47 C.F.R. § 22.917(a) (the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB); OOBE limits for PCS, 47 C.F.R. § 24.238(a) (the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB); OOBE limits for AWS, 47 C.F.R. § 27.53(h) (the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB).

[62] 47 C.F.R. § 22.355 (the carrier frequency of each transmitter must be maintained within the tolerances given in Table C–1 of § 22.355).

[63] 47 C.F.R. § 90.219(b).

[64] 47 C.F.R. § 90.210.

[65] 47 C.F.R. § 90.219.

[66] 47 C.F.R. § 90.247.

ensure compliance with our existing technical rules[67] and shut down automatically if operating in violation of those rules. As explained above, malfunctioning, poorly designed or improperly installed signal boosters have the potential to create substantial interference to wireless networks. For example, if a device is improperly installed,[68] it may exceed its designated power or OOBE limits and may oscillate and disrupt communications between nearby mobile devices and a base station.[69] Public safety and wireless industry commenters also recognize the need to prevent oscillation and suggest that all signal boosters be required to incorporate automatic oscillation detection and shutdown features.[70]

37. Accordingly, we propose that all signal boosters must monitor the device's compliance with all applicable technical requirements for mobile devices for the band in which they operate (*e.g.* power, OOBE). We believe base station technical limits are not applicable because they would allow significantly higher power levels, which are not warranted for this service. If it is determined that the device is operating outside of the applicable technical parameters, we propose that the device must be capable of shutting itself down automatically within ten (10) seconds (or less). We further propose that the device must remain off for at least one (1) minute before restarting. If after five (5) restarts, the device is still not operating consistent with applicable technical rules, it must shut off and remain off until manually restarted by the device operator. We also propose that all signal boosters must detect feedback or oscillation (such as may result from insufficient isolation between the antennas) and deactivate the uplink transmitter within 10 seconds of detection. After such deactivation, the booster must not resume operation until manually reset. These built-in technological safeguards would minimize the potential for harmful interference to wireless networks.

38. We seek detailed comment on our proposal and proposed rule language in Appendix A, including the appropriate triggers to initiate device shut down. In addition, we query whether signal boosters should monitor for any other parameters and, if so, how such monitoring would be accomplished and at what additional cost. Further, we seek specific comment on whether the existing technical rules that apply to mobile devices in Parts 22, 24 and 27 are appropriate for all signal booster devices. Are these technical limits adequate to address varying types of signal booster installations, *e.g.,* personal use vs. carrier and enterprise installations, which are typically professionally installed and designed to cover large areas such as office buildings or arenas? We note that signal boosters can be designed for use on both the Personal Communications Service (PCS) and Cellular Radiotelephone Service bands, but different technical requirements apply to these bands; does this create unnecessary design challenges for signal booster manufacturers? We also note that mobile subscriber unit power is subject to an ERP limit, which is appropriate for devices with integrated antennas, while most signal boosters do not have integrated antennas. Would transmitter output power be a more appropriate power limit measure for signal booster devices? We request detailed comment on the appropriate technical limits that should apply to signal boosters for each band of operation, including the associated costs and benefits.

39. We also seek comment on other technical requirements that may be necessary to ensure

[67] *See supra* n. 59.

[68] For example, if there is insufficient isolation between the signal booster's transmit and receive antennas.

[69] *See supra* ¶ 16.

[70] *See* Breton W. MacAloney Comments at 1; Brian Hunt Comments at 1; Candell Comments at 2; City of Phoenix Comments at 1; Phoenix Fire Department Comments at 1; David Clemons Comments at 1; American Association of State Highway and Transportation Officials Comments at 3-4; Gregory T. Bunting Comments at 1; Jason Matthews, Lake County Sheriff's Office Comments at 1; County of San Bernardino Comments at 1; NENA Comments at 1, 3-5; APCO Comments at 2-3; Patrick Becker, Glendale Fire Department Comments at 1; King County, Washington Regional Communications Board Comments at 1-3; CelLynx Comments at 2; CommScope Comments at 3; CTIA Comments at 4; Nextivity Comments at 5.

signal boosters do not negatively affect carriers' networks. For example, some commenters expressed concern that wideband signal boosters generate additional radio frequency (RF) noise that can reduce the capacity and reliability of the network even when subscriber signals are not amplified.[71] We seek detailed comment and analyses on the impact of wideband signal booster use on wireless networks. How are these impacts different from narrowband signal boosters? How can wideband signal boosters be designed to avoid potential problems? Can specific device features minimize network impact, *e.g.,* programmability to a specific frequency block or powering on only when needed to amplify a signal? Specifically, how would such design features affect device cost?

40. *RF Exposure.* As discussed above, we propose to apply the relevant Part 22, 24, 27 or 90 mobile station technical requirements to signal boosters. In addition, we propose to prohibit signal boosters that are designed to be used so that the radiating structure(s) is/are within 20 centimeters of the user or other persons, as defined for portable devices in section 2.1093(b). Thus, we propose to permit only fixed and mobile signal boosters, which will be governed by the RF exposure rules regarding how the devices are deployed. The RF exposure rules in sections 1.1307 and 2.1091 outline exposure limits, equipment authorization requirements, and other regulatory requirements that are based on the type of device, how it is deployed or used, the power of its transmissions, and the proximity of its antenna and radiating structures to a person's body.[72] To maintain RF exposure compliance, the operation of signal boosters can be highly dependent on how they are installed and operated with respect to the fixed and mobile exposure conditions required by sections 1.1307 and 2.1091; therefore, in addition to the routine evaluation currently required under section 2.1091 for Parts 22, 24, 27 and 90 devices, clear installation and user operating instructions/requirements are proposed to be necessary for installers and end users to satisfy RF exposure requirements.

41. Our existing RF exposure rules have proven effective in ensuring compliance for the deployment and use of existing signal boosters, and thus we see no reason to change the existing RF exposure requirements. We will, however, outline these requirements in a new section 95.1627. Specifically, we propose to maintain our requirement that routine RF exposure evaluation is required for signal boosters authorized under Part 95 that operate under fixed and mobile exposure conditions. We propose to amend sections 1.1307(b) and 2.1091 of the Commission's rules accordingly. In addition, as required by section 2.1091, applications for equipment authorization shall contain a statement confirming compliance with the RF exposure limits for both the fundamental and unwanted emissions. Further, technical information showing the basis for compliance with RF exposure requirements must be submitted to the Commission upon request. Since signal boosters operating in fixed-mounted configurations are generally deployed similarly to subscriber transceiver antennas,[73] we propose to require labeling for these types of signal boosters as similarly required for subscriber transceiver antennas in Table 1 of section 1.1307(b)(1). We seek comment on all aspects of our proposal.

42. *Labeling and Marketing Requirements.* We propose that all signal boosters must be labeled and marketed to consumers with clear information specifying the legal use of the device. Numerous commenters request a marketing and/or labeling requirement for signal boosters. The DAS Forum's code of conduct proposal would require that the sale of a signal booster "be accompanied by a notice stating that it is the responsibility of the owner/installer to coordinate with the appropriate local carrier(s) prior to

[71] *See, e.g.*, *Ex Parte* Letter from Jeanine Poltronieri, Assistant Vice President, External Affairs, AT&T Services, Inc., to Marlene Dortch, Secretary, Federal Communications Commission (May 28, 2010) (AT&T May 28, 2010 *Ex Parte* Letter) at 8.

[72] *See* 47 C.F.R. §§ 1.1307(b), 2.1091, and 2.1093.

[73] For example, fixed consumer transmitting antennas typically are installed on home rooftops where access would be occasional but not controlled.

operation in order to avoid harmful interference."[74] The DAS Forum maintains that such a notice requirement would remind all installers of signal boosters of their responsibilities, which in turn will facilitate coordination and interference prevention.[75] The Wireless Communications Association International, Inc. (WCAI) suggests that all marketing materials for signal boosters include a "clear and conspicuous warning that such devices cannot be operated without an FCC license or the express authorization of an FCC licensee."[76] WCAI proposes that such a warning be included on all websites, point-of-sale materials, and packaging materials.[77] Bird Technologies asks that we require labeling for Part 90 signal boosters.[78] CTIA asserts that a labeling requirement will help avoid consumer confusion and aid in the prevention of interference caused by signal boosters.[79]

43. We propose that marketing materials must include a prominently placed "consumer disclosure" notifying consumers that the signal booster can only be operated consistent with Part 95, Subpart M. For example, for signal boosters offered online or via direct mail or catalog, the consumer disclosure should be prominently displayed in close proximity to the images and descriptions of each signal booster. In addition, we propose that all signal booster packaging must prominently display the consumer disclosure using a label, either on or otherwise affixed to the package. Specifically we propose that all signal boosters marketed on or after six months from the effective date of our rules must include the following advisories in 12-point or greater typeface (1) in any marketing materials, (2) in the owner's manual, (3) on the outside packaging of the device, and (4) on a label affixed to the device:

> WARNING. Operation of this device is on a secondary non-interference basis and must cease immediately if requested by the FCC or a licensed wireless service provider.

44. In addition to the above, signal boosters intended for fixed operation must include the following advisory:

> WARNING. Operation of this device must be coordinated with, and information on channel selection and operating power must be obtained from, the applicable spectrum licensees authorized in the area of deployment. Licensee information is available at www.fcc.gov/signalboosters.

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[74] DAS Forum Comments at 6; DAS Forum Reply Comments at 5.

[75] DAS Forum Comments at 7; DAS Forum Reply Comments at 5-6. Verizon Wireless agrees that the DAS Forum's proposed notice requirement is a "step in the right direction" towards preventing interference. Verizon Wireless Comments at 23.

[76] WCAI Comments at 13. WCAI asks that the warning indicate that a subscriber is responsible for obtaining an FCC license and ensuring that the device is FCC certified. *Id.* at 13-14.

[77] *Id.* at 14.

[78] Bird Technologies Petition at 9. Bird Technologies proposes that all Part 90 signal boosters be affixed with a readily visible warning label indicating that (1) non-licensees may only deploy signal boosters with the express written consent of a licensee; (2) such written consent must include the specific location(s) of the signal booster equipment; (3) only certified equipment may be used; (4) FCC regulations regarding RF levels at antennas, power levels and antenna locations must be met; and (5) failure to comply may result in a fine pursuant to 18 U.S.C. § 1001. *Id.* APCO supports the labeling requirement proposed by Bird Technologies. APCO Comments at 2.

[79] *Ex Parte* Letter from Brian M. Josef, Director, Regulatory Affairs, CTIA, to Marlene Dortch, Secretary, Federal Communications Commission (June 3, 2010) (CTIA June 3, 2010 *Ex Parte* Letter) at 3.

45. We seek comment on our proposals, including the text of our proposed rules included in Appendix A. In addition, we seek comment on whether to require manufacturers, retailers, and any other entity marketing or selling signal boosters to display the consumer disclosure language conspicuously at the point-of-sale and on their websites. We also seek comment on whether to include enforcement language as part of the consumer disclosure.

46. *Operator Requirements.* We also propose that if a signal booster is causing harmful interference as defined in Part 2.1 of our rules,[80] the operator of the device must immediately cease operations. While we believe that our proposed rules will facilitate the development and deployment of robust signal boosters which will not harm wireless networks, in the event harmful interference does occur, this safeguard confirms that an interfering signal booster operator must cease operation. In addition, as explained in more detail below, we seek comment on whether signal booster operators should register their devices with a national signal booster clearinghouse prior to operation.[81] We seek comment on our proposals and proposed rule language contained in Appendix A. In addition, we seek comment on whether and how signal booster operators should be protected from interference from other signal booster operations.

3. Fixed Signal Booster Requirements

47. Our proposed rules seek to facilitate the development of signal boosters which do not cause harmful interference to wireless networks. Avoiding harmful interference, however, will differ for fixed and mobile signal boosters. Accordingly, in addition to the general requirements discussed above, we propose additional and separate requirements for fixed and mobile signal boosters.

48. Fixed signal boosters[82] can affect wireless service providers' management of their networks' system capacity. Global System for Mobile Communications (GSM) operators, for example, allot available channels among clusters of base stations and then carefully coordinate reuse of those frequencies among the clusters to maximize system capacity. If frequencies assigned to fixed signal boosters are not coordinated with the provider, their use can potentially disrupt a provider's frequency reuse plan because certain frequencies may have been assigned by the provider to an adjacent cell site or sector, increasing the likelihood of co-channel interference.

49. Fixed signal boosters operating in 800 MHz spectrum with interleaved commercial and public safety operations present additional challenges. Sprint Nextel states that many local jurisdictions require building owners to install in-building signal booster systems to improve the coverage of public safety communications inside buildings.[83] According to Sprint Nextel, to accommodate multiple public safety channels, these systems tend to use 800 MHz wideband signal boosters, which cover the entire 800 MHz band.[84] Because the public safety channels remain interleaved with Sprint Nextel's channels in many markets, Sprint Nextel explains that the 800 MHz wideband signal boosters installed for public safety use can amplify Sprint Nextel's signal, which can overload nearby Sprint Nextel base stations

[80] 47 C.F.R. §2.1 defines harmful interference as "[i]nterference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with [the ITU] Radio Regulations."

[81] *See infra* ¶¶ 64-66.

[82] For purposes of this proceeding, the term fixed signal booster refers to a signal booster that is operated at a fixed location, *e.g.*, office building, tunnel, garage, home.

[83] Sprint Nextel Comments at 3-5.

[84] *Id.* at 3.

resulting in dropped calls, reduced network capacity, and degraded Sprint Nextel service in a building.[85] King County, Washington Regional Communications Board (KCRCB) suggests that for signal boosters on all public safety bands, licensees whose signal is being received by the signal booster at a signal strength greater than -90 dBm must be notified prior to the booster being turned on, so the licensee can monitor its system for interference, or alternatively, all boosters must be licensed.[86]

50. Sprint Nextel also argues that coordinated installation of in-building signal boosters can "ensure that installation is completed and adjusted in a balanced manner so that the public safety coverage in the building is improved without disrupting service at nearby Sprint Nextel base stations."[87] Sprint Nextel maintains that the "proper functioning" of signal boosters can be ensured when the use of signal boosters is coordinated with all wireless licensees whose signals will be affected by the signal booster and when signal booster installation reflects the "actual radio environment surrounding the site."[88] Sprint Nextel adds that network operators routinely modify the channels used on base stations to address customer demand.[89] Motorola states that all affected licensees should reach agreement and consent to signal booster deployment, but acknowledges that coordination can be challenging and suggests that comment be sought on the best method for licensees to be notified and have the opportunity to object to the use of a signal booster.[90]

51. We believe that the concerns described above can be addressed by requiring all operators of fixed consumer signal boosters to coordinate frequency selection and power levels with applicable carrier(s) prior to operation. For purposes of this proceeding, the term "fixed signal booster" refers to a signal booster that is operated at a fixed location, *e.g.*, office building, tunnel, garage, home. We seek comment on this proposal and our proposed rules, including whether there are other requirements specific to fixed signal boosters that we should mandate. For example, is coordination sufficient to address the power control concerns of CDMA carriers or should all signal boosters be equipped with dynamic power control capabilities? What would be needed to accomplish sufficient dynamic power control and at what cost? In addition, what type of coordination should be required for temporary or emergency deployment of signal boosters? Further, how should the coordination process accommodate a carrier's subsequent network changes? We note that, as drafted, our proposed rule would permit fixed, outdoor installation of signal boosters. We recognize, however, that such outdoor installations may pose additional installation challenges for achieving adequate antenna attenuation, among other things. Accordingly, we query whether additional safeguards are necessary for fixed, outdoor signal booster installations, such as a professional installation requirement?

52. We recognize, however, that there may be instances where a service provider may not timely respond to coordination requests. We seek comment on how to administer a coordination requirement

[85] *Id.* at 4.

[86] KCRCB Comments at 2.

[87] Sprint Nextel Comments at 4.

[88] *Id.* at 5.

[89] *Id.* Another issue raised by Sprint Nextel resulting from uncoordinated signal booster use is the potential for unreliable handoffs. According to Sprint Nextel, in markets where it uses both 800 MHz and 900 MHz channels as part of its integrated iDEN network, although a subscriber's radio might see a stronger control channel signal on 800 MHz, when a customer makes a call and is assigned a 900 MHz voice channel (which is not amplified by the signal booster), the call may be dropped due to the relatively lower signal strength of the non-boosted 900 MHz voice channel. *Id.*

[90] Motorola Comments at 9. *See also* Potter Comments at 2 (requesting that signal boosters "amplify the smallest amount of spectrum possible necessary to supplement the licensed system").

that balances the need for timely coordination with the resulting burdens on carriers. We seek detailed comment on how the coordination should be structured, including whether to impose specific timelines for responding to a coordination request and what dispute resolutions procedures are necessary in the event the parties cannot reach a coordination agreement.

4. Mobile Signal Booster Requirements

53. In order to prevent mobile signal boosters[91] from causing harmful interference to wireless networks, different safeguards are necessary. Unlike fixed devices, mobile signal boosters cannot reasonably be coordinated with nearby carrier base stations in advance. In lieu of that coordination, we seek to ensure that mobile signal boosters only operate when needed, and cease operations when they are unnecessary. We therefore propose to require a signal booster operating in a mobile environment to power down[92] or shut down as the device approaches the base station with which it is communicating.[93] If implemented in signal boosters, such a safeguard could protect a service provider's network by mitigating excess noise to base stations from signal boosters that are operating but not needed. We seek comment on this proposal and proposed rules contained in Appendix A, including how this concept would be implemented and enforced. Could the devices simply turn off when not needed or could a dynamic power control similar to that used by mobile phones be implemented in a signal booster? Commenters should address the technical, operational and economic challenges to such an approach.

54. While powering down or shutting down will reduce noise at the base station with which the device is communicating, a signal booster can also introduce noise to other carriers' base stations (the "near-far problem"). For example, a signal booster communicating with Carrier "A," far from carrier A's base station may be near Carrier "B's" base station and introduce excessive noise to Carrier B. In this vein, we seek comment on whether and how we should address the near-far problem.[94] How best can a mobile signal booster prevent noise generation with base stations with which it is not communicating? For example, should we only permit carrier-specific signal boosters for mobile applications, or should we require that mobile signal boosters be tethered to the phone or only be approved if they have a docking station to ensure amplification of only the desired signal of the operator? If such protection is necessary, how should it be accomplished? Specifically, how will additional design features influence device cost? Are there other potential problems that manufacturers should address? Several commentators also suggest that mobile signal boosters include some form of automatic gain control to avoid base station overload.[95] We seek comment on whether we should require devices to have automatic gain control and how that should be accomplished.

5. Other Proposals

55. In response to the *Signal Boosters Public Notice,* four parties submitted alternate proposals

[91] For purposes of this proceeding, the term "mobile signal booster" refers to a signal booster that is operated in a mobile environment, *e.g.*, car, boat, RV.

[92] For example, current cell phones are equipped with dynamic power control, which allows the phone to operate at the minimum power necessary to achieve communications.

[93] This requirement would be in addition to the general parameters outlined above. *See supra* ¶¶ 33-46.

[94] Such a safeguard would address adjacent channel noise or the "near-far" problem. *See supra* ¶ 15. To address the near-far problem, CelLynx Group, Inc. proposes that signal booster manufacturers "must ensure that the output power remain in the FCC compliant range." CelLynx Reply Comments at 5.

[95] *See* AT&T Comments at 29; Nextivity Comments at 5 (ensure that the signal gain is at least 30 dB less than the path loss between the base station and the booster); Candell Comments at 2; CelLynx Comments at 2; Brian Hunt Comments at 1.

which may facilitate the development of well-designed, properly operating and installed signal boosters while controlling, preventing and, if necessary, resolving interference to wireless networks. We have carefully examined these proposals and, where appropriate, have incorporated specific elements from these proposals where they appeared narrowly tailored to address carriers' concerns about network reliability and management, into the Commission's overall proposal.

56. *AT&T Proposal*. Although AT&T "strongly opposes any FCC regulations that force wireless licensees to permit boosters on their networks without explicit and carrier-specific authorization," it nevertheless proposes a set of "presumptive authorization" standards that would permit "everyday wireless users" to operate "off-the-shelf" signal boosters on wireless networks while imposing "safeguards to prevent harmful interference."[96] AT&T's proposes five "safeguards." First, AT&T proposes that wireless licensees have "ultimate control" over any signal boosters operating on their networks under a presumptive authorization.[97] Specifically, signal booster operators must activate their devices with the licensee prior to initial use.[98] In addition, the booster must possess technology to permit the licensee's network to identify the device as a booster and identify its location at all times.[99] Further, the licensee must have "dynamic control over the boosters' transmit power" and have the authority and ability to turn off the booster for any reason at any time.[100] Alternatively, AT&T proposes that the booster have "automatic gain control functionality that adjusts the power provided to the booster based on distance to the relevant base station."[101] Second, AT&T proposes that signal boosters may only be operated on a channelized basis on the frequencies authorized for use by the wireless licensee whose signal is being boosted.[102] AT&T suggests that manufacturers could meet this requirement by selling carrier-specific narrowband boosters or by designing "intelligent" boosters that limit transmissions to the spectrum licensed to the carrier whose signal is being boosted.[103]

57. Third, AT&T proposes that signal boosters be designed with oscillation detection and will terminate transmission when oscillation occurs.[104] Fourth, AT&T proposes an expanded certification process for signal boosters that are to be used pursuant to a presumptive authorization. Specifically, the booster would be subject to (1) the Commission's equipment certification process; (2) an industry-driven certification process;[105] and (3) individual licensee approval to ensure compliance with the licensee's

[96] AT&T May 28, 2010 *Ex Parte* Letter at 7. AT&T notes that its proposed presumptive authorization standards would not necessarily apply to DAS providers who AT&T anticipates will continue to seek licensee consent prior to initiation of service consistent with current practices. *Id.*

[97] *Id.*

[98] *Id.*

[99] *Id.*

[100] *Id.*

[101] *Id.* at 7 n.32.

[102] *Id.* at 8.

[103] *Id.*

[104] *Id.*

[105] By way of example, AT&T points to the equipment certification process for GSM handsets which includes a Mobile Equipment Type Certification from the PCS-1900 Type Certification Review Board, a private type certification review board established by North American wireless providers which tests all handsets on the carriers' behalves to ensure compliance with North American cellular and PCS network standards. *Id.* at 9.

proprietary confidential network protocols.[106] Fifth, AT&T proposes that any presumptive authorization standards be applied prospectively and that the Commission bring enforcement action against parties that sell, market, or use devices that do not meet the presumptive standard.[107]

58. *CTIA Proposal.* CTIA requests that we "promote the adoption of technical and design standards for signal boosters that would mitigate harmful interference."[108] Specifically, CTIA proposes that signal booster manufacturers and wireless licensees work together to develop technical and design features that would minimize the risk of interference to wireless networks.[109] CTIA proposes a non-exhaustive list of features that would serve this goal. For example, CTIA states that signal boosters could be designed with automatic gain control which "would allow the booster to sense the power of the local base station and modify the booster's gain accordingly."[110] In addition, CTIA proposes that fixed boosters, at a minimum, contain a GPS chipset that provides coordinates of the installation location, remote shut-off capability, which would allow carriers to shut down a malfunctioning booster causing harm to the network, and a mechanism for relaying accurate E-911 location information.[111] CTIA adds that fixed boosters should only operate on a channelized or narrowband basis and that comprehensive, verifiable installation standards would "better ensure interference-free operation."[112] Regarding mobile signal boosters, CTIA proposes that, at a minimum, they contain a remote shut-off function, oscillation detection with automatic shut down, components to manage the device's power based on proximity to a base station, and a mechanism for relaying accurate E-911 location information.[113] In addition, CTIA proposes that mobile signal boosters only be operated on a channelized or narrowband basis and that the Commission establish an equipment certification process via a reliable third party similar to the wireless handset certification process.[114] CTIA also maintains that signal booster design must consider next generation wireless networks.[115]

59. *DAS Forum Proposal*. The DAS Forum proposes that the Commission adopt a mandatory industry code of conduct applicable to devices installed by professionals who typically coordinate with wireless providers as well as devices sold directly to consumers.[116] First, the DAS Forum proposes that the sale of a signal booster or repeater be accompanied by a notice stating that it is the responsibility of the owner or installer to coordinate with the appropriate local carrier(s) prior to operation in order to avoid harmful interference.[117] Second, the DAS Forum proposes to require the owner or installer of the

[106] *Id.*

[107] *Id.*

[108] CTIA June 3, 2010 *Ex Parte* Letter at 4.

[109] *Id.* at 4-5.

[110] *Id.* at 4. CTIA explains that the booster could turn itself off if the received signal level from the base station is strong enough. *Id.*

[111] *Id.*

[112] *Id.*

[113] *Id.* AT&T and CommScope, Inc. express similar concerns over the need to satisfy E-911 Phase II caller location requirements. AT&T May 28, 2010 *Ex Parte* Letter at 3; CommScope Comments at 3.

[114] CTIA June 3, 2010 *Ex Parte* Letter at 4.

[115] *Id.* at 4-5.

[116] We note that in light of the carrier coordination requirement, the DAS Forum proposal would only apply to fixed signal boosters since mobile signal boosters cannot be coordinated.

[117] DAS Forum Petition at 6.

signal booster to provide the carrier(s) with the device's FCC certification number or other information concerning the technical characteristic of the equipment and its location sufficient to demonstrate, by testing or otherwise, that it is unlikely to cause interference.[118] Third, the DAS Forum would require the owner or installer of the equipment to coordinate with the relevant carrier(s) prior to operation.[119] As evidence of coordination, the DAS Forum's proposal would require licensees to notify the owner or installer of the equipment in writing or by email, regarding the successful conclusion of the coordination.[120] Further, the DAS Forum proposes that such notification could not be unreasonably withheld.[121] Finally, the DAS Forum proposes that upon notification by a carrier that a signal booster is causing harmful interference, the operator would be required to take all steps necessary to eliminate the interference.[122]

60. *Wilson Proposal.* Wilson asks the Commission to "codify[] standards for the certification of handset amplifiers for use in the CMRS."[123] Wilson proposes that we amend Part 20 of our rules to enumerate requirements for certification of transmitters, including signal boosters, to be used in the CMRS. Specifically, Wilson states that such transmitters must (1) meet the technical requirements for the applicable bands of operation; (2) contain "integrated oscillation shutdown protection and balanced bi-directional amplification;" and (3) contain automatic protection for nearby base stations from an increase in the cell site receiver noise floor.[124] On September 23 and October 6, 2010, Wilson supplemented its signal booster proposal with additional technical requirements including, incorporation of "a capability to allow the carriers to shut [signal boosters] off if they cause problems" and integrated automatic power control and power sensing.[125] In addition, Wilson proposed that signal boosters be required to comply with applicable rules and industry standards for supported modes (*e.g.,* CDMA, GSM, PCS) such that the booster is "transparent to the cell phone, therefore allowing the cell phone to materially comply with applicable standards."[126] Wilson also proposed that signal boosters be prohibited from increasing the noise floor more than .07 dB.[127] Wilson also proposed grandfathering all existing, deployed signal boosters.[128]

61. We seek comment on the four proposals outlined above, including whether additional elements of these proposals should be included in the Commission's comprehensive proposal for signal boosters. For example, we note that there appears to be some commonality between the proposals

[118] *Id.* at 7. The DAS Forum explains that the owner or installer could provide the carrier(s) with the name and qualifications of the installer, if any, including any service contracts. *Id.*

[119] *Id.*

[120] *Id.*

[121] *Id.*

[122] *Id.* at 8.

[123] Wilson Petition at 17.

[124] *Id.* at Attachment 1. Wilson also proposes a number of revisions to the Commission's definitions of "handset amplifier," "In-building radiation system," "repeater," and "signal booster." *Id.*

[125] *Ex Parte* Letter from Russell D. Lukas, Counsel, Wilson Electronics, Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission (Sept. 23, 2010) at 2 (Wilson Sept. 23, 2010 *Ex Parte* Letter).

[126] *Ex Parte* Letter from James W. Wilson, President, Wilson Electronics, Inc., to Marlene H. Dortch, Secretary, Federal Communications Commission (Oct. 6, 2010) at 2.

[127] Wilson Sept. 23, 2010 *Ex Parte* Letter at 2.

[128] *Id.* at 1.

submitted by AT&T, CTIA, and Wilson regarding the need for signal boosters to include a form of remote shut-off capability. Should we include remote shut-off capability among the safeguards in the Commission's proposed framework and how should it be implemented? In addition, should such a shut-off feature be subject to a quantitative or qualitative standard, *e.g.,* reasonable network management? Also, should we require boosters to incorporate location detection features as suggested by some commenters? Further, we seek detailed comment on the impact of signal booster use on network-based E-911 systems, including how manufacturers might implement CTIA's proposal to require signal boosters to include a mechanism for relaying accurate E-911 location information.[129] We also encourage comment on other safeguards not currently included in the Commission's proposal or the alternate proposals above that could promote signal booster use. Commenters advocating additional safeguards should address the costs and benefits of such additional features.

6. Treatment of Existing Signal Boosters

62. We recognize that there are signal boosters being operated today by CMRS licensees or others, which will not meet the requirements we propose in the NPRM. We seek comment on how such boosters should be treated. Further, should we sunset the use of existing signal boosters which do not meet our proposed safeguards or grandfather certain existing signal boosters? In addition, to the extent the Commission determines to grandfather certain signal boosters and adopts a signal booster registration requirement, we query whether grandfathered devices should also be subject to such a requirement.[130]

63. At the same time, we seek to provide an orderly transition to signal boosters that meet any new requirements developed in this proceeding, and minimize public confusion about whether particular devices are legal for use going forward. We propose a two-step approach to achieving these goals. First, we propose that, beginning 30 days after the effective date of final rules in this proceeding, all applications for equipment authorization must show that the device meets the new rules.[131] Second, we propose that, beginning six months from the effective date of our rules, all signal boosters marketed or sold in the United States must meet our proposed safeguards. This approach encourages manufacturers to quickly transition to devices that meet the new rules, providing near-term equipment options for licensees and consumers. We seek comment on this proposal, including whether these timeframes are reasonable.

C. National Signal Booster Clearinghouse

64. Many commenters observe that signal booster interference is complicated by the lack of information about precisely where the devices are installed.[132] Sprint notes a laborious process for determining and correcting signal booster interference where "network teams" drive around using

[129] We note that the Commission is seeking comment on leveraging network components to enhance location accuracy in its proceeding regarding E911 location accuracy. *See* Wireless E911 Location Accuracy Requirements; E911 Requirements for IP-Enabled Service Providers, *Further Notice of Proposed Rulemaking and Notice of Inquiry*, 2010 FCC LEXIS 5757 at ¶ 41 (2010).

[130] Nothing in this item affects the ability of the Commission's Enforcement Bureau to investigate and take appropriate action to resolve instances of interference caused by signal boosters.

[131] This applies to new applications as well as applications for permissive changes to previously certificated boosters. Specifically, applications for permissive changes to previously certificated boosters pursuant to section 2.1043 must comply with the new requirements.

[132] *See* Sprint Nextel Comments at 8. *See also* Bird Technologies Petition at 6 ("Since there are few records of where consumers have installed signal boosters, it is extremely difficult for licensees to locate oscillating signal boosters or to identify or contact the party responsible for correcting the problem.").

sophisticated and costly radio frequency monitoring equipment to locate the interference source.[133] CTIA echoes this concern noting the difficulty of "identifying the location and operator of the offending booster."[134] Likewise, the Public Safety Department of St. Lucie County, Florida states that "it is critical to Public Safety that these signal booster systems be . . . registered with the licensee of the system for which it will serve" so that signal booster locations are documented in the event the devices malfunction and cause interference.[135]

65. While the technical and operational safeguards we propose herein reduce the likelihood that interference will occur, in the event it does occur, there may be benefits to requiring signal booster operators to register their devices prior to use. For example, a national signal booster clearinghouse could hasten interference resolution by providing licensees with a quick resource for identifying nearby signal boosters and points of contact. Similarly, a clearinghouse could be useful to identify sources of interference for future network changes. Accordingly, we seek comment on whether signal booster operators should be required to register their devices with a national clearinghouse prior to operation. Further, we seek detailed comment on how a clearinghouse could be structured and what information should be required. Specifically, we seek comment on how a clearinghouse could be administered, by whom, and whether there are technical or programmatic features that could aid compliance with a registration requirement, *e.g.,* signal boosters could be equipped with features that would prevent operation until properly registered. Commenters should also address the costs and benefits of a registration requirement.

66. While recognizing the potential benefits of signal booster registration, we are mindful of the burden a registration requirement might create for consumers. We thus seek comment on practical measures we might adopt to minimize or eliminate consumer burdens. For example, should certain types of devices be excluded from registration, *e.g.,* consumer versus professionally installed devices? Likewise, should any registration requirement be limited to fixed signal boosters because their precise locations are known and registration would allow licensees to quickly identify all fixed boosters in a particular area in the event interference is observed at a base station? Finally, we query whether, given the transient nature of the location of mobile signal boosters, registration would be effective in helping to identify and prevent interference from signal boosters.

D. Signal Boosters for Part 90 Private Land Mobile Radio Service Operations

67. Regarding Part 90 PLMR, non-consumer signal boosters operated by licensees, we propose revisions to the technical and operational requirements aimed at preventing interference. Specifically, we propose to:

- Retain the Class A (narrowband) and Class B (wideband) regulatory distinctions and permit private land mobile fixed (Class A and B) and mobile (Class A only) devices.
- Make clear that Class B devices must be limited to confined areas such as buildings, tunnels,

[133] Sprint Nextel Comments at 8. Sprint further explains that locating interference using triangulation techniques is an inexact process because signals can bounce off some surfaces and be absorbed by others, which creates an irregular signal footprint. In addition, site access for both the suspected location of the interference and to optimal observation points can be difficult or impossible to obtain, which further consumes carrier time and resources. *Id.*

[134] CTIA Reply Comments at 7, 13.

[135] Gregory T. Bunting Comments at 1. St. Lucie County has adopted a building code which requires certain types of buildings to ensure sufficient signal levels for public safety frequencies (806-809 MHz and 851-854 MHz). The ordinance also outlines a method for determining signal adequacy, requires the use of FCC certified equipment and requires device registration, including equipment type, location and contact information. *Id.*

parking structures, etc., but allow Class B signal boosters to be connected to external antennas that can communicate with base stations.

- Seek comment on whether to relax or otherwise improve the power and emission limits for Class A and Class B devices.
- Seek comment on whether to require Part 90 PLMR, including 700 MHz public safety broadband (non-consumer) devices, to also meet the technical and coordination requirements for consumer signal boosters.
- Seek comment on the impact of the proposed rules on public safety vehicular external antennas and whether additional flexibility should be afforded to such uses.

We encourage commenters to address the costs and benefits of the Commission's proposals as well as any alternatives proposed by commenters.

68. Wireless radio services regulated under Part 90 of our rules present unique circumstances that warrant additional consideration.[136] The majority of licensees regulated under this rule part are companies, local governments, and other organizations which are not in the business of providing telecommunications services to the public and operate PLMR systems to facilitate their business or public safety functions, *e.g.,* emergency response communications, two-way radio dispatch.[137] While these entities must be familiar with and comply with all applicable FCC rules, they often rely on the use of certificated, turn-key equipment to meet the technical requirements of our rules.[138] In addition, Part 90 licensees are generally licensed for a single or group of individual channel pairs in a specific location on a coordinated basis.[139] Moreover, many Part 90 channels are interleaved and a licensee's channels may not be adjacent to one another. Because of the unique circumstances presented by Part 90 PLMR services, the Commission has implemented specific rules governing signal boosters for Part 90 licensees.

69. In 1996, the Commission adopted Part 90 signal booster rules, which defined two classes of signal boosters for Part 90 operations and established section 90.219 to address their use.[140] Part 90 defines a "signal booster" as a device at a fixed location which automatically receives, amplifies and retransmits on a one-way or two-way basis, the signals received from base, fixed, mobile, and portable stations, with no change in frequency or authorized bandwidth.[141] Under Part 90, a signal booster may be either narrowband (Class A), where the booster amplifies only those discrete frequencies intended to be retransmitted, or wideband (Class B), where all signals within the passband of the signal booster filter are amplified.[142] Under section 90.219, licensees authorized in frequency bands above 150 MHz may employ

[136] Part 90 services include both commercial specialized mobile radio (SMR) as well as PLMR service.

[137] With the exception of SMR licensees, most Part 90 radios are used by the licensee directly; Part 90 PLMR licensees typically do not have subscribers. Part 90 PLMR licensees include public safety agencies, utilities, railroads, and manufacturers.

[138] The technical expertise of these licensees can vary greatly; some licensees may have the expertise to install and modify their own radio facilities while others rely on third parties to fulfill these functions.

[139] By contrast, commercial services regulated under Parts 22, 24, and 27 are licensed by blocks of spectrum over predefined geographic areas.

[140] *See* Amendment of Parts 22, 90, and 94 of the Commission's Rules to Permit Routine Use of Signal Boosters*, Report and Order*, 11 FCC Rcd 16621 (1996) (*Signal Boosters Report and Order*); *Memorandum Opinion and Order*, 12 FCC Rcd 6896 (1997)(*Signal Boosters MO&O*).

[141] 47 C.F.R. § 90.7.

[142] *Id*.

signal boosters at fixed locations in accordance with applicable power and emission limits. However, a signal booster may not be used to extend the licensee's service area.[143] In addition, Class B boosters may only be operated in enclosed areas and licensees are required to correct interference should it occur.[144] We note that although the Commission did not discuss the mobile use of signal boosters when it adopted the Part 90 signal booster framework in 1996, it did not prohibit such use. Thus, since the adoption of the Part 90 signal booster rules, mobile signal boosters have been certificated and manufactured for use in Part 90 spectrum consistent with the basic technical rules applicable to all transmitters in the service.

1. Commercial vs. Private Part 90 Signal Booster Operation

70. Part 90 services include both subscriber-based services and PLMR, which warrant different approaches for signal booster operation. In order to promote regulatory parity, we propose to apply the same technical and operational requirements to all consumer signal boosters. Thus, we propose that Part 90 consumer signal booster operators must comply with proposed section 95.1600 *et seq.* of our rules. In addition, however, given the unique characteristics of Part 90 licensing, we also propose that Part 90 consumer signal booster operators must comply with existing technical requirements for Part 90 signal boosters and any new requirements we may adopt in the course of this proceeding. PLMR signal booster operators will continue to be required to comply with existing Part 90 signal booster requirements and any new requirements we may adopt in the course of this proceeding. We seek comment on our approach, including the costs and benefits, but query whether some or all of the technical and regulatory framework proposed above for consumer signal boosters should be applied to Part 90 PLMR signal boosters.

2. Part 90 Signal Booster Classifications

71. *Petitions and Comments.* Petitioners and commenters ask us to clarify the definitions and proper use of signals boosters under the Part 90 rules. Bird Technologies asks us to eliminate the distinction between Class A and Class B boosters.[145] Bird Technologies argues that Class A boosters have never been widely used due to the expense, complexity, and long group delays[146] associated with narrowband filtering.[147] Further, Bird Technologies states that the FCC certification process does not distinguish between Class A and Class B signal boosters.[148] In addition, Bird Technologies notes that newer, channelized signal boosters using digital signal processing amplify individual or groups of signals linearly and are thus hybrids of narrowband and wideband boosters.[149] Bird Technologies also requests that we modify our rules to limit Part 90 signal booster passbands to the minimum necessary to amplify the frequencies of the authorized licensee.[150]

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[143] 47 C.F.R. § 90.219.

[144] *Id*.

[145] Bird Technologies Comments at 4. Bird Technologies suggest that we delete the reference to Class A boosters from 90.219. *Id.*

[146] Group delay is the instantaneous rate of change of phase with respect to frequency of a filter, usually shown in a phase versus frequency plot. *See* http://www.frequencydevices.com/guide/Glossary_of_terms.html, (last visited Sept. 14, 2010).

[147] Bird Technologies Comments at 4.

[148] *Id.* at 5.

[149] *Id.*

[150] Bird Technologies Petition at 9.

72. Motorola asks us to seek comment on eliminating Class B signal boosters.[151] Motorola argues that Class A signal boosters are preferable to Class B signal boosters because Class A signal boosters pose less of an interference risk and are becoming more cost competitive.[152] If the Commission continues to permit Class B signal boosters, Motorola proposes that prior to deployment, all affected licensees within the passband should have notice and an opportunity to object to the proposed use of a Class B booster.[153] RF Industries Pty. Ltd. (RFI) notes that the Australian regulatory authority only allows Class A signal booster use in spectrum with site-based licensing and that any use must be coordinated with other licensees.[154] RFI also notes that in Australia, Class B signal boosters are only permitted in geographically licensed bands where contiguous spectrum is auctioned to interested parties.[155] RFI, generally supports greater regulation of signal boosters where equipment approval is tied to compliance with base station testing standards.[156]

73. Jack Daniel asserts that there continues to be a need for Class B signal boosters. According to Jack Daniel, Class A boosters are not yet cost competitive with Class B signal boosters and Class A signal boosters are not less likely to cause interference.[157] Jack Daniel explains that the need for Class A signal boosters is primarily driven by the interleaving of commercial mobile radio services, such as Sprint Nextel, with other Part 90 licensees.[158] According to Jack Daniel, when 800 MHz re-banding is complete, almost every signal booster requirement can be met with a Class B booster.[159] Jack Daniel states that due to the difficulty in designing a narrowband Class A signal booster which only amplifies a discrete narrowband 12.5 kilohertz channel, all boosters essentially operate as Class B.[160] Jack Daniel asks us to clarify that any signal booster amplifying any bandwidth greater than the authorized channel width is a Class B booster.[161] George Potter also argues that Class B signals boosters should continue to be permitted, but should only be allowed to amplify the smallest amount of spectrum necessary to supplement the licensed system.[162]

74. *Proposal.* We propose to maintain the Class A and Class B distinctions for signal boosters in Part 90. Class A signal boosters allow Part 90 licensees with interleaved channels to meet their own needs without affecting neighboring licensees. In addition, the record demonstrates a demand and need for Class B signal boosters where proper installation and licensee coordination can avoid interference. We believe that maintaining the Class A and Class B signal booster distinction affords licensees the flexibility to deploy signal boosters to fill in dead spots in coverage, extend coverage into buildings and

[151] Motorola Comments at 8.

[152] *Id.*

[153] *Id.* at 9.

[154] RFI Comments at 2-3.

[155] *Id.*

[156] *Id*. at 7.

[157] Jack Daniel Reply Comments at 9.

[158] *Id.*

[159] *Id.* at 16.

[160] *Id.* at 12. According to Jack Daniel, in order to address group delay, programmable Class A signal boosters actually have to pass 3 or more assigned bandwidths, in effect making them Class B boosters. *Id.*

[161] Jack Daniel Comments at 3.

[162] Potter Comments at 1.

obstructed areas, and provide extended range for public safety entities in rural areas with poor signal coverage. We seek comment on our proposal and take this opportunity to seek comment on further distinctions, definition changes, or operational requirements for Class A and Class B signal boosters to ensure they are properly deployed and operated in the public interest.

3. Part 90 Signal Booster Operation

75. *Petitions and Comments.* Petitioners and commenters disagree on where and how Class B signal boosters can be deployed. Section 90.219(d) states that Class B signal boosters "are permitted to be used only in confined or indoor areas such as buildings, tunnels, underground areas, etc., or in remote areas, *i.e.,* areas where there is little or no risk of interference to other users."[163] Some parties argue that the phrase "or in remote areas" in section 90.219(d) has caused confusion regarding precisely where Class B signal boosters can be used.[164] Canam Technology, Inc. (Canam), for example, argues that the phrase "or in remote areas" contained in section 90.219(d) was inserted in error when the rules were initially published in the Federal Register and was never intended to be adopted by the Commission.[165] Jack Daniel requests that we amend our rules to specify that Class B signal boosters may be used inside buildings in urban areas as well as "remote areas."[166]

76. Commenters also disagree about whether the Class B boosted signal must be fully contained within the confined area of operation or whether an outside antenna can be used to allow a boosted return link to a base station.[167] Canam asks that we clarify our rules to confirm that Class B signal boosters may not be used to boost signals outside of a confined area.[168] Canam and the New York City Transit Authority (NYCTA) assert that section 90.219(d) prohibits Class B signal boosters from being connected to external antennas.[169] Instead, NYCTA argues that any return link or outdoor amplification should be limited to a Class A narrowband signal booster.[170]

77. In contrast, Jack Daniel asks that we clarify that section 90.219(d) permits Class B signal boosters to be used to amplify return link signals from portable devices in enclosed areas to the licensee's associated base or repeater stations.[171] According to Jack Daniel, most Class B installations are designed to provide coverage within a building and allow the two-way signal booster to relay signals to and from the licensee's authorized base or repeater stations.[172] Jack Daniel maintains that Class B boosters deployed in large buildings are particularly important for public safety entities responding to in-building emergencies.[173] In addition, Jack Daniel notes that many local jurisdictions now require building owners to install signal boosters in large buildings to address police and fire personnel communication needs.[174]

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[163] 47 C.F.R. § 90.219(d).

[164] *See, e.g.*, Jack Daniel Petition at 3-5; Canam Comments at 5.

[165] Canam Comments at 5.

[166] Jack Daniel Reply Comments at 14.

[167] *See e.g.*, *id.* at 14; Canam Comments at 3; NYCTA Reply Comments at 3.

[168] Canam Comments at 3-6.

[169] NYCTA Comments at 3; Canam Comments at 1-6.

[170] NYCTA Comments at 3.

[171] Jack Daniel Comments at 3.

[172] Jack Daniel Reply Comments at 14.

[173] *Id.*

The Association of Public-Safety Communications Officials-International, Inc. (APCO) and the California Public-Safety Radio Association (CPRA) support Jack Daniel's requested clarification.[175]

78. *Proposal.* We believe that Class B signal booster use should be limited to confined areas such as buildings, tunnels, parking garages or other structures where the signal would be contained. Accordingly, we propose to remove the language "or in remote areas"[176] from section 90.219(d) in order to clarify where Class B signal boosters may operate. Class B signal boosters amplify all signals within the device's passband, which makes it difficult to coordinate Class B signal booster use where different licensees have interleaved narrowband channels.[177] Because of this additional level of complexity, Class B signal booster use in the Part 90 bands should continue to be restricted to enclosed areas where the signals can be more easily controlled.[178] The removal of the "or in remote areas" language should also eliminate any confusion regarding the allowable geographic locations for Class B signal boosters. Class B boosters can be deployed in both urban and rural areas so long as they are installed in a confined area; Class B signal booster use is not restricted to rural or remote areas. We seek comment on our proposal. In addition, we seek comment on how to structure a reasonable transition process for existing Class B signal boosters that do not meet our proposed rules. For example, should we temporarily grandfather such devices and if so, under what terms and for what period of time?

79. We also propose to allow Class B signal booster operators to pair enclosed, Class B signal boosters with external antennas in order to provide a return path to the licensee's base or repeater station. Containing a Class B booster's signal completely within a structure eliminates the device's primary function – to facilitate signals into and out of obstructed areas. This type of deployment is used to facilitate public safety communications during in-building emergencies and many local jurisdictions require in-building signal boosters for this purpose.[179] If properly coordinated and installed, such in-building signal booster systems can provide an important communications link without causing interference.[180] We seek comment on our proposal. In addition, we seek comment on how to facilitate non-licensee use of Part 90 PLMR Class B signal boosters for in-building emergency communications,

(Continued from previous page)
[174] *Id.*

[175] CPRA Comments at 3; APCO Comments at 2.

[176] In 1996, when the Commission adopted section 90.219 to allow Part 90 Class B signal boosters, the Commission sought to address interference concerns raised by wideband signal boosters amplifying signals not assigned to the licensee. *Signal Boosters Report and Order*, 11 FCC Rcd at 16628 ¶ 17. The Commission thus restricted Class B booster use "to areas that are confined or enclosed such as tunnels, underground parking garages, and within buildings (*i.e*., areas where there is little or no risk of interference to others)." *Id*. The Federal Register Summary for this item, however, erroneously added the phrase "or in remote areas" to the end of that clause. *See* 61 Fed. Reg. 31051. On reconsideration, TX/RX Systems, Inc. (TX/RX) sought clarification of the meaning of the term "remote areas" as included in the Federal Register Summary of the rules. *See* TX/RX Petition for Reconsideration, WT Docket No. 95-70, filed July 19, 1996. Apparently unaware of the erroneous language added in the Federal Register, the Commission declined to make such a clarification explaining that the adopting Order did not include any reference allowing signal boosters in "remote areas." *See Signal Boosters Memorandum Opinion and Order*, 12 FCC Rcd At 6899 ¶ 8. *See also* Canam Comments at 5.

[177] We do not propose to similarly limit non-Part 90 wideband consumer signal boosters because they do not operate in interleaved bands and thus do not pose the same potential for interference. In addition, the safeguards we propose for consumer signal booster use add further levels of interference protection.

[178] Class A signal boosters can be used in mobile and outdoor deployment scenarios.

[179] *See e.g.,* Jack Daniel Reply Comments at 14-16; APCO Comments at 2.

[180] *See e.g.,* Bird Technologies Comments at 4; Jack Daniel Reply Comments at 14.

including whether we should adopt our proposed consumer signal booster license-by-rule approach for such use. We also seek comment on whether additional safeguards are necessary to control interference from in-building signal booster systems. For example, how can the return link be coordinated and deployed in confined areas over frequency ranges that cover multiple licenses? Should we restrict the return link to Class A signal boosters only?

4. Part 90 Mobile Signal Boosters

80. *Comments.* When the Commission established the current Part 90 rules for signal boosters in 1996, the *Signal Boosters Report and Order* was silent on mobile uses of such devices.[181] The majority of comments addressing Part 90 signal boosters argue that mobile signal boosters are not permitted under Part 90 rules.[182] In contrast, APCO contends that Class A signal boosters should be allowed in vehicles where the licensee approves the installation or operates the signal booster on its own network.[183] We also note that many commenters from rural areas, including public safety entities, support mobile signal booster use in the CMRS bands because these devices enable communications in poor signal areas when they otherwise would not be possible.[184]

81. *Proposal.* Our current policy affords Part 90 licensees flexibility to implement a variety of devices, including mobile signal boosters, on their authorized channels as long as technical requirements are met and coordinated service boundaries are maintained. We propose to amend our rules to codify this policy and explicitly permit Part 90 licensees to use mobile signal boosters on their assigned frequencies. We recognize, however, that interleaved Part 90 channels present additional complications for controlling interference due to the number of different licensees that could be affected. For these reasons, we do not believe wideband, mobile Class B signal boosters should be allowed on interleaved Part 90 channels. We thus propose to only allow Part 90 licensees to operate mobile Class A signal boosters on their assigned frequencies. We recognize that our proposal may prevent Part 90 mobile consumer signal booster use because of the difficulty in designing a Class A mobile signal booster. We seek comment on our proposal including how our proposal will affect Part 90 mobile consumer signal booster use. Should Part 90 SMR licensees or their subscribers be permitted to operate mobile Class B signal boosters? Should 700 MHz public safety broadband licensees or their public safety users be permitted to operate mobile Class B boosters? What additional safeguards or requirements would be necessary to allow Class B signal boosters in a mobile environment without increased interference potential? Should we permit mobile Class B signal boosters if the mobile device is tethered or placed in a docking station, such that only the desired mobile signal is amplified?

82. *Mobile Amplifiers.* In addition, Jack Daniel ask us to clarify that a mobile amplifier is distinct from a mobile signal booster.[185] Specifically, Jack Daniel proposes that we define mobile amplifiers as "radio frequency amplifiers that physically connect[] to the mobile radio, portable or handset, typically [via] the antenna connector."[186] Historically, we have treated these devices as Part 90 transmitters for PLMR public safety and business/industrial pool licensees and allowed their use so long

[181] *See Signal Boosters Report and Order*, 11 FCC Rcd 16621.

[182] *See e.g.*, Potter Comments at 2; Bird Technologies Petition at 9; King County Regional Communications Board Comments at 3; Sprint Nextel Comments at 2.

[183] APCO Comments at 3.

[184] *See, e.g.*, Harbor Electronics Comments at 1; Dawn Smith Comments at 1; Bill M Comments at 1; Lt. Steve Farmer Comments at 1.

[185] Jack Daniel Comments at 2.

[186] *Id.*

as they did not result in the device operating outside of Part 90 technical rules.[187] Given this opportunity to review the use of these Part 90 amplifiers, we seek comment on whether any restrictions should be placed on these devices. For example, should commercial SMR service subscribers be permitted to use mobile amplifiers under a different set of technical requirements and what should they be? Most SMR subscriber radios have integrated antennas so connecting an external antenna may not be possible, but we seek comment on the viability of mobile amplifiers for SMR services. Does connecting the amplifier directly to the mobile device via a physical connection adequately address the interference concerns raised in this proceeding? What technical limits should be applied to mobile amplifiers, *e.g.,* should we adopt separate power limits other than those that apply to Part 90 mobile radios generally, should we require automatic gain control or other features to ensure these devices do not cause interference? Should we require that mobile amplifiers be tested with specific radio models to ensure that, when combined, the devices together meet applicable technical requirements in order to merit certification?

5. Technical and Other Issues for Part 90 PLMR Signal Boosters

83. *Emission Limits for Part 90 Signal Boosters*. Commenters state that due to the use of narrowband digital modulation techniques since the signal booster rules were adopted, today's Class A signal boosters are not able to boost discrete digital narrowband channels without incurring group delay which could cause intermittent problems with the receiver's performance.[188] Commenters explain that narrowband boosters must amplify a bandwidth which is three or more channels beyond the licensee's assigned bandwidth to address the group delay problem.[189] Canam proposes that we amend section 90.219(c) to remove the requirement that Class A signal boosters meet the emission mask(s) of section 90.209 for each channel that is being amplified, but leave in place other requirements designed to prevent interference.[190] According to Canam, this would allow Class A signal boosters to be designed to have a wider passband (*e.g.,* 60 kHz, with ultimate rejection greater than 60 dB at ±75 kHz) for each channel amplified, which would resolve the group delay problem.[191] Canam argues that with this permitted emission measurement, a booster could still be properly considered Class A because it would not amplify the signals of an adjacent channel licensee unless the consent of that licensee had been obtained.[192] Further, Canam notes that even though such a signal booster would have a wider passband, if the input signals comply with the appropriate emission mask, the corresponding output signals would also comply, provided that the signal booster maintains the "spectral integrity" of the input signals.[193] Canam suggests that FCC equipment certification could verify that a signal booster performs satisfactorily in this regard.[194]

84. Dick Abbot also recommends changes to the Class A emission requirements to allow the use

[187] Such devices allow land mobile licensees to dock lower powered hand-held devices or attach a hand-held radio to an external antenna to achieve sufficient mobile power levels when in poor signal areas.

[188] *See e.g*., Jack Daniel Reply Comments at 12; Canam Comments at 6.

[189] *See, e.g*., Jack Daniel Reply Comments at 12.

[190] *See* Canam Comments at 6-8.

[191] According to Canam, the 60 kHz passband would result in a "practical" group delay of about 30 microseconds. Canam Comments at 6-8.

[192] *Id.*

[193] *Id.*

[194] *Id.*

of wider filters, resulting in less propagation delay.[195] Mr. Abbot argues that the requirements of section 90.210 appear to have been written for transmitters, and not retransmitters. Therefore, Mr. Abbot suggests that the power of any re-transmitted emission must be attenuated below the unmodulated carrier power of the signal booster as follows: (1) on any frequency removed from the center of the re-transmitted channel frequency by 25 kHz but less than 50 kHz, at least 17 dB; and (2) on any frequency removed from the center of the re-transmitted channel frequency by more than 50 kHz, at least 50 dB.[196]

85. Regarding Class B signal boosters, George Potter urges that Class B boosters be required to amplify the smallest amount of spectrum necessary to supplement the licensed system. Additionally, Mr. Potter asks the Commission to develop standards to specify filter roll off (such as 35 dB of suppression one megahertz above the highest frequency and one megahertz below the lowest frequency being amplified).[197]

86. We believe there may be merit in the suggestion by commenters to relax the emission limits for Class A signal boosters to allow for consideration of the group delay issue. Accordingly, we seek comment as to what passband technical specifications (that could be verified through our equipment certification process) should be required for Class A boosters in lieu of the current requirement to meet the standard emission masks for transmitters. Would it be appropriate to use the 60 kHz passband (at -3 dB), 150 kHz (at -60 dB) specification proposed by Canam? Or should the maximum allowable passband be scaled in some way to the occupied bandwidth of the channel to be amplified? What sort of technical specification would be appropriate to verify the linearity and performance characteristics of a Class A signal booster to ensure that the out-of-band emissions of boosted signals are not degraded by intermodulation products or spurious emissions?[198]

87. We also seek comment on the appropriate emission limits for Class B signal boosters. Is Mr. Potter's suggested emission mask sufficient for Class B signal boosters? Are Class B signal boosters programmable such that the roll off characteristics can be adjusted to apply to the upper and lower spectrum boundaries of the licensee's desired spectrum range? What other types of emission limitations should be considered for Class B signal boosters and how should compliance with these limits be measured in the equipment certification process?

88. *Signal booster power limits*. Motorola requests that Class A signal boosters be allowed to transmit at 35 watts ERP.[199] Motorola contends that the 5 watt limitation is necessary for Class B signal boosters, but it is not necessary for Class A boosters because Class A devices only amplify authorized channel(s) and the resultant power of the signal would not be any greater than a mobile or base station radio.[200] Motorola argues that the increased power will not increase interference and would make distribution systems more economical, reduce the number of antennas needed, and improve coverage.[201]

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[195] Dick Abbot Comments at 1-2.

[196] *Id.*

[197] Potter Comments at 1.

[198] Intermodulation or intermodulation distortion (IMD) is the unwanted amplitude modulation of signals containing two or more different frequencies in a system with nonlinearities. The intermodulation between each frequency component will form additional signals at frequencies that are not, in general, at harmonic frequencies (integer multiples) of either, but instead often at sum and difference frequencies of the original frequencies. *See* http://en.wikipedia.org/wiki/Intermodulation (last visited Sept. 27, 2010).

[199] Motorola Comments at 9.

[200] *Id.*

[201] *Id.*

Jack Daniel opposes an increase in the Class A signal booster power limit above the existing 5 watt ERP limit due to interference concerns.[202] Jack Daniel argues that increasing the power limit for Class A signal boosters could increase interference due to the difficulty in obtaining antenna isolation.[203] In addition, Jack Daniel states that the devices could exceed FCC and Occupational Safety and Health Administration human exposure levels.[204] Jack Daniel argues that a licensee wishing to exceed the 5 watt limit can do so under the current Part 90 rules by licensing the location as a base or repeater station.[205]

89. While we recognize that increased power limits for Class A signal boosters may facilitate more economical distribution systems, such increased power limits come with added interference concerns and complexity. A properly engineered and installed higher power Class A signal booster could be useful to fill in dead spots in outdoor coverage or to more economically cover large buildings. However, increasing the power limit would also significantly increase the device's interference potential and could present RF exposure issues if not carefully deployed. We believe more information is needed on this issue before a decision can be made. We thus seek comment on whether Part 90 signal boosters (both Class A and Class B) should be permitted to increase their power levels. What increased power levels are appropriate and what additional safeguards should be adopted? If we permit Class A signal boosters to operate at higher levels, should such operation be limited to fixed applications? Should we decrease the power limit for mobile Class A boosters to minimize interference potential?

90. Regarding Jack Daniel's clarification request on the power permitted for Class B signal boosters,[206] we believe the original *Signal Boosters Report and Order* establishing section 90.219 is clear that Class B signal boosters will be permitted 5 watts ERP per channel amplified.[207] We seek comment on whether this power limit remains appropriate for Class B signal boosters and whether it is expressed clearly in section 90.219(b) or whether the language "limited to 5 watts ERP for each authorized frequency that the booster is designed to amplify"[208] has created confusion.

91. *Equipment authorization for Part 90 signal boosters.* We also take this opportunity to augment the record on additional issues related to signal booster power levels. Specifically, a review of the equipment authorization database reveals that signal boosters have been certified with a wide range of signal booster power levels, many well in excess of 5 watts transmitter output power. This is because at the time of equipment authorization, the testing authority does not know how the device will be installed, how much signal will be lost in cables to outside antennas or the type of antenna that will be used. Nor does the testing authority know if the device will be installed as a signal booster subject to power limits in section 90.219 or as an amplifier that will be connected directly to a radio and not subject to the 5 watt ERP limit. Given these practical realities, is 5 watt ERP the proper power limit for signal boosters? Is ERP is the best measure of power for signal boosters? Is the existing equipment authorization process sufficient to ensure signal boosters are approved in such a way that their operation is consistent with our rules? To ensure proper authorization of devices for their intended use, should we require documentation or labeling on signal amplification devices to describe how the device is to be used under our rules? Should we change the way we measure compliance for signal boosters to better differentiate between

[202] Jack Daniel Reply Comments at 7-9.

[203] *Id.*

[204] *Id.*

[205] *Id.*

[206] *See* Jack Daniel Petition at 3.

[207] *See Signal Boosters Report and Order,* 11 FCC Rcd at 16629 ¶ 20.

[208] 47 C.F.R. § 90.219(b).

Class A and Class B signal boosters or between a signal booster and an amplifier designed to connect directly to a radio? While measuring field strength of a device would ensure compliance with our rules, it would make it difficult for the installer to address the wide range of deployment scenarios. We thus seek comment on other rules or techniques that can be used in the equipment authorization process to ensure signal boosters are properly operated.

92. *PLMR Signal Booster Registration.* PLMR signal booster operation, like consumer signal booster use, presents the same potential for interference to wireless operations.[209] We thus seek comment whether, consistent with any registration process we may adopt for consumer signal booster operators, PLMR signal booster operators should also be required to register their signal boosters with a national, centralized clearinghouse prior to use. If interference from a PLMR booster occurs, the clearinghouse could provide other Part 90 licensees with a ready resource for identifying and rectifying the source of the interference. Further, we seek comment on whether any registration requirement would apply to fixed, mobile, or both types of signal boosters.

93. *Other design requirements.* We also seek comment on whether Part 90 PLMR signal boosters, including 700 MHz public safety broadband (non-consumer) devices, should be required to implement some or all of the safeguards we propose for consumer signal boosters, such as automatic monitoring and shut down capabilities.[210] Are these additional safeguards necessary for Class A signal boosters which are designed and deployed by the licensee to amplify only their authorized channel(s)?

94. *800 MHz Rebanding*. As noted by several commenters, 800 MHz Part 90 frequencies are subject to a rebanding process to resolve interference issues related to a mix of interleaved commercial, private and public safety channels.[211] Once rebanding is complete, the separation of commercial SMR frequencies from Part 90 PLMR channels will facilitate the deployment of signal boosters with less complication and fewer instances of interference. Jack Daniel points out, however, that after rebanding, thousands of consumers will likely continue to operate existing signal boosters unaware that the signals they are trying to amplify have been moved to other spectrum.[212] Accordingly, Jack Daniel suggests that we establish a deadline for the removal of these devices from service.[213] Jack Daniel acknowledges that implementation of such a deadline will require the participation of retailers and manufacturers of the products.[214] We seek comment on the impact of rebanding on existing and future uses of Part 90 signal boosters. Should we establish a sunset date for the operation of existing Part 90 Class B signal boosters that operate in the 800 MHz band? How should we effectuate such a sunset? Given that Part 90 consumer operations would likely be limited to the rebanded SMR frequencies, should there be different technical requirements for signal boosters on those frequencies than for devices that would operate in the public safety and business/industrial pool? Recognizing the complexities involved in the rebanding process, should we exclude Part 90 consumer signal boosters from the general consumer signal booster license–by-rule framework until after the completion of the rebanding process?

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[209] *See supra* ¶¶ 14-21.

[210] *See supra* at ¶¶ 33-54.

[211] *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, 15021-45, 15069 ¶¶ 88-141, 189 (2004); *Supplemental Order and Order on Reconsideration,* 19 FCC Rcd 25120 (2004); *Memorandum Opinion and Order*, 20 FCC Rcd 16015 (2005); *Second Memorandum Opinion and Order,* 22 FCC Rcd 10467 (2007); *Third Memorandum Opinion and Order,* 22 FCC Rcd 17209 (2007).

[212] Jack Daniel Reply Comments at 4.

[213] *Id.*

[214] *Id.*

95. *Request for forbearance on conflicting regulations to local zoning laws*. Jack Daniel requests that the Commission forbear from adopting any regulations that would hinder local zoning decisions that require the installation of signal boosters in buildings to facilitate communications by public safety first responders.[215] Jack Daniel argues that many local governments have adopted or are considering code requirements that would require the installation of Class B signal boosters in buildings, and that the Commission should not usurp, via an assertion of exclusive jurisdiction, local zoning requirements by adopting conflicting rules.[216]

96. Our intent in this proceeding is to facilitate the development and deployment of well-designed signal boosters which will expand wireless coverage for consumers without harming wireless networks. We do not seek to preempt local governments' authority to require the installation of signal boosters pursuant to fire or other building codes in the context of this proceeding. Any such installations, however, are required to comply with our existing rules applicable to signal boosters and will be required to comply with any rules which we may adopt in this proceeding.

V. PROCEDURAL MATTERS

A. Initial Regulatory Flexibility Analysis

97. As required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the policies and rules addressed in this *NPRM*. The IRFA is set forth in Appendix B. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to this *NPRM* and must have a separate and distinct heading designating them as responses to the IRFA. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of this Notice, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration.

B. Initial Paperwork Reduction Act Analysis

98. This document contains proposed new information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

C. Other Procedural Matters

1. *Ex Parte* Rules – Permit-But-Disclose

99. This rulemaking shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.[217] Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentations must contain summaries of the substance of the presentations and not merely a listing of the subjects discussed. More than a one or two sentence description of the views and

[215] Jack Daniel contends that the National Fire Protection Association and the International Code Council support these local fire code requirements regarding the installation of signal boosters. Jack Daniel Petition at 9.

[216] *Id.* at 10.

[217] 47 C.F.R. §§ 1.1200 *et seq*.

arguments presented generally is required.[218] Other requirements pertaining to oral and written presentations are set forth in section 1.1206(b) of the Commission's rules.[219]

2. Comment Filing Procedures

100. Pursuant to sections 1.415 and 1.419 of the Commission's rules,[220] interested parties may file comments and reply comments regarding the Notice on or before the dates indicated on the first page of this document. All filings related to this Notice of Proposed Rulemaking should refer to WT Docket No. 10-4. Comments may be filed using: (1) the Commission's Electronic Comment Filing System (ECFS), (2) the Federal Government's eRulemaking Portal, or (3) by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: http://www.fcc.gov/cgb/ecfs/ or the Federal eRulemaking Portal: http://www.regulations.gov. Filers should follow the instructions provided on the website for submitting comments.
    - ECFS filers must transmit one electronic copy of the comments for WT Docket No. 10-4. In completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and the applicable docket number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions, filers should send an e-mail to ecfs@fcc.gov, and include the following words in the body of the message, "get form." A sample form and directions will be sent in response.
- Paper Filers: Parties who choose to file by paper must file an original and four copies of each filing. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). All filings must be addressed to the Commission's Secretary, Marlene H. Dortch, Office of the Secretary, Federal Communications Commission, 445 12th Street, S.W., Washington, D.C. 20554.
    - All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th Street, S.W., Room TW-A325, Washington, DC 20554. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.
    - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.
    - U.S. Postal Service first-class, Express, and Priority mail should be addressed to 445 12th Street, S.W., Washington D.C. 20554.

101. Parties should send a copy of their filings to Joyce Jones, Federal Communications Commission, Room 6404, 445 12th Street, S.W., Washington, D.C. 20554, or by e-mail to joyce.jones@fcc.gov. Parties shall also serve one copy with the Commission's copy contractor, Best

[218] *See* 47 C.F.R. § 1.1206(b)(2).

[219] 47 C.F.R. § 1.1206(b).

[220] 47 C.F.R. §§ 1.415, 1.419.

Copy and Printing, Inc. (BCPI), Portals II, 445 12th Street, S.W., Room CY-B402, Washington, D.C. 20554, (202) 488-5300, or via e-mail to fcc@bcpiweb.com.

102. Documents in WT Docket No. 10-4 will be available for public inspection and copying during business hours at the FCC Reference Information Center, Portals II, 445 12th Street S.W., Room CY-A257, Washington, D.C. 20554. The documents may also be purchased from BCPI, telephone (202) 488-5300, facsimile (202) 488-5563, TTY (202) 488-5562, e-mail fcc@bcpiweb.com.

3. Accessible Formats

103. To request materials in accessible formats for people with disabilities (Braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice) or 202-418-0432 (TTY). Contact the FCC to request reasonable accommodations for filing comments (accessible format documents, sign language interpreters, CART, etc.) by e-mail: FCC504@fcc.gov; phone: 202-418-0530 or TTY: 202-418-0432.

VI. ORDERING CLAUSES

104. Accordingly, IT IS ORDERED pursuant to sections 4(i), 4(j), 301, 303(r), and 307 of the Communications Act of 1934, 47 U.S.C. §§ 154(i), 154(j), 301, 303(r), 307 that this Notice of Proposed Rulemaking IS HEREBY ADOPTED.

105. IT IS FURTHER ORDERED that, pursuant to Sections 4(i), 4(j), 301, and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 301 , 303(r) and Section 1.2 of the Commission's rules, 47 C.F.R. § 1.2, the Petition for Declaratory Ruling filed on September 25, 2008, by Jack Daniel, DBA Jack Daniel Company IS DENIED.

106. IT IS FURTHER ORDERED that, pursuant to Sections 4(i), 4(j), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 303(r), and Section 1.407 of the Commission's Rules, 47 C.F.R. § 1.407, that the Petitions for Rulemaking filed by Bird Technologies Group on August 18, 2005, by The DAS Forum (A Membership Section of PCIA – The Wireless Infrastructure Association) on October 23, 2009, and by Wilson Electronics, Inc. on November 3, 2009, ARE GRANTED to the extent provided herein, and otherwise ARE DENIED.

107. IT IS FURTHER ORDERED that the Commission’s Consumer & Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Notice of Proposed Rulemaking, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Proposed Rules

Parts 1, 2, 22, 24, 27, 90 and 95 of Title 47 of the Code of Federal Regulations are amended as follows:

Part 1 – PRACTICE AND PROCEDURE

1. The authority citation for Part 1 continues to read as follows:

AUTHORITY: 15 U.S.C. 79 *et seq*.; 47 U.S.C. 151, 154(j), 160, 201, 225 and 303.

2. Section 1.307 is amended by adding a new row to Table 1 below the existing row for Private Land Mobile Radio Services and above the existing row for Amateur Radio Service, and by revising paragraph (b)(2) as follows:

§ 1.1307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

* * * * *

(b) * * *
(1) * * *

TABLE 1 – TRANSMITTERS, FACILITIES AND OPERATIONS SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

Service (title 47 CFR rule part)	Evaluation required if:
* * * * *	* * * * *
Signal Booster Radio Service (part 95)	In building radiation system where antenna(s) mounted < 2.5 m above the floor and total power of all channels > 60 W ERP (100 W EIRP) The Signal Booster Radio Service provisions in part 95 shall apply only if a label is affixed to the transmitting antenna that: (1) provides adequate notice regarding potential radiofrequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transmitting antennas; and (2) references the applicable FCC-adopted limits for radiofrequency exposure specified in §1.1310.
* * * * *	* * * * *

(2) Mobile and portable transmitting devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services (PCS), the Satellite Communications Services, the Wireless Communications Service, the Maritime Services (ship earth stations only), the Specialized Mobile Radio Service and the 3650 MHz Wireless Broadband Service, authorized under Subpart H of part 22, parts 24, 25, 27, 80, 90, and 95 of this chapter, are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in §§ 2.1091 and 2.1093 of this chapter. In addition, mobile transmitting devices that operate in the Signal Booster Radio Service authorized under part 95 of this chapter, are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in § 2.1091 of this chapter. * * *

* * * * *

Part 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

3. The authority citation for Part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302A, 303, and 336, unless otherwise noted.

4. Section 2.1091 is amended by revising paragraph (c) to read as follows:

§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

* * * * *

(c) Mobile devices that operate in the Cellular Radiotelephone Service, the Personal Communications Services, the Satellite Communications Services, the Wireless Communications Service, the Maritime Services, the Specialized Mobile Radio Service, and the Signal Booster Radio Service authorized under Subpart H of part 22, parts 24, 25, 27, 80, (ship earth stations devices only), 90 and 95 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if they operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more. * * *

* * * * *

PART 22—PUBLIC MOBILE SERVICES

5. The authority citation for Part 22 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 222, 303, 309, and 332.

6. Add new § 22.9 to read as follows:

§ 22.9 Operation of certificated signal boosters.

Individuals and non-individuals may operate certificated signal boosters on frequencies regulated under this part provided that such operation complies with all applicable rules under this part and all applicable rules under subpart M, part 95 of this chapter (Signal Booster Radio Service). Failure to comply with all applicable rules voids the authority to operate a signal booster.

PART 24—PERSONAL COMMUNICATION SERVICES

7. The authority citation for Part 24 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 309, and 332.

8. Add new § 24.9 to read as follows:

§ 24.9 Operation of certificated signal boosters.

Individuals and non-individuals may operate certificated signal boosters on frequencies regulated under this part provided that such operation complies with all applicable rules under this part and all applicable rules under subpart M, part 95 of this chapter (Signal Booster Radio Service). Failure to comply with all applicable rules voids the authority to operate a signal booster.

PART 27—MISCELLANEOUS WIRELESS COMMUNICATION SERVICES

9. The authority citation for Part 27 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

10. Add new § 27.9 to read as follows:

§ 27.9 Operation of certificated signal boosters.

Individuals and non-individuals may operate certificated signal boosters on frequencies regulated under this part provided that such operation complies with all applicable rules under this part and all applicable rules under subpart M, part 95 of this chapter (Signal Booster Radio Service). Failure to comply with all applicable rules voids the authority to operate a signal booster.

PART 90—PRIVATE LAND MOBILE RADIO SERVICES

11. The authority citation for Part 90 continues to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), and 332(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7).

12. Section 90.7 is revised by adding a definition for signal amplifier and amending the definition of signal booster to read as follows:

§ 90.7 Definitions.

Signal amplifier. A device that is installed between a radio transmitter and an external antenna, which amplifies the outgoing signal.

Signal booster. A device that automatically receives, amplifies, and retransmits on a bi- or unidirectional basis, the signals received from base, fixed, mobile, or portable stations, with no change in

frequency or authorized bandwidth. Signal boosters may be either narrowband (Class A) or wideband (Class B). Class A narrowband signal boosters may be deployed at fixed locations or as mobile devices, and amplify signals only on those channels authorized to the licensee. Class B wideband signal boosters are restricted to fixed deployments in enclosed areas such as buildings, underground parking garages, and transit tunnels, and amplify all signals across an entire frequency band.

13. Section 90.219 is revised to read as follows:

§ 90.219 Use of signal boosters.

Licensees authorized to operate radio systems in the frequency bands above 150 MHz may operate signal boosters subject to the following conditions:

(a) *General requirements*. Signal boosters may only retransmit an amplified signal on the exact frequency (or frequencies, if applicable) of the originating base, fixed, mobile, or portable station. Signal boosters may only be used to fill in weak signal areas within an authorized license area and cannot extend the system's signal coverage area.

(b) *Class A requirements*. Class A (narrowband) signal boosters may be deployed at fixed locations or as mobile devices, and may amplify signals only on those channels authorized to the licensee. Class A boosters must include automatic level control circuitry. Class A boosters must not exceed an average effective radiated power (ERP) of 5 watts. Class A boosters must meet the out-of-band emission limits of § 90.210 for each narrowband channel that the booster is designed to amplify.

(c) *Class B requirements*. Class B (wideband) signal boosters are restricted to fixed deployments in enclosed areas such as buildings, underground parking garages, and transit tunnels, and amplify all signals across an entire frequency band. Class B boosters must not exceed an average ERP of 5 watts for each authorized channel that the booster is designed to amplify. Class B boosters must meet the emission limits of § 90.210 for frequencies outside of the booster's designed passband.

(d) *Operating authority*. Licensees are authorized to operate certificated signal boosters without separate authorization from the Commission. Individuals and non-individuals may operate certificated signal boosters on Part 90 frequencies that are used for the provision of subscriber-based services subject to the conditions enumerated in subpart M, part 95 of this chapter. Only certificated equipment may be operated, and the operator must comply with all applicable rules.

(e) *Interference remediation*. Licensees and other operators of signal boosters must correct any harmful interference that the equipment may cause to other systems. Normal co-channel transmissions will not be considered harmful interference. Interference resolution is subject to the conditions in § 90.173(b).

PART 95—PERSONAL RADIO SERVICES

14. The authority citation for Part 95 is revised to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), 307(e), and 332 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 307(e), 332.

15. Section 95.401 is amended by adding a new paragraph (h) to read as follows:

§ 95.401 (CB Rule 1) What are the Citizens Band Radio Services?

* * * * *

(h) *Signal Booster Radio Service*—the use of bi- or unidirectional radio frequency amplifiers by licensees, individuals, and non-individuals for the purpose of enhancing their wireless radio service. The rules for this service are in subpart M of this part.

16. New subpart M is added to read as follows:

Subpart M—Signal Booster Radio Service

Subpart M—Signal Booster Radio Service

§ 95.1601 Basis and purpose.

(a) *Basis*. The rules in this subpart are issued pursuant to the Communications Act of 1934, as amended, 47 U.S.C. 151 *et. seq.*

(b) *Purpose*. The purpose of the rules in this subpart is to establish the requirements and conditions under which signal boosters may be certificated, marketed, sold, and operated.

§ 95.1603 Scope.

This subpart contains rules governing signal boosters used to enhance wireless radio service on frequencies used for the provision of subscriber-based services.

§ 95.1605 Definitions.

The following terms and definitions apply to the rules in this subpart.

Signal booster. A device that automatically receives, amplifies, and retransmits on a bi- or unidirectional basis, the signals received from base, fixed, mobile, or portable stations, with no change in frequency or authorized bandwidth.

Uplink. The portion of a signal booster that receives signals from a wireless device and amplifies and transmits them to a wireless system.

§ 95.1611 Authorization to operate certificated signal boosters.

(a) Section 95.401(h) and this part authorize individuals and non-individuals to operate certificated signal boosters without individual licenses. Any individual or non-individual, other than a representative of a foreign government, may operate a certificated signal booster pursuant to this subpart and subject to the specific requirements of section 95.1623.

(b) A signal booster can only be certificated and operated if it complies with all applicable rules in this subpart and all applicable technical rules for the frequency band(s) of operation including, but not limited to: § 22.355, Public Mobile Services, frequency tolerance; § 22.913, Cellular Radiotelephone Service effective radiated power limits; §22.917, Cellular Radiotelephone Service, emission limitations for cellular equipment; § 24.232, Broadband Personal Communications Service, power and antenna height limits; § 24.238, Broadband Personal Communications Service, emission limitations for Broadband PCS equipment; § 27.50, Miscellaneous Wireless Communications Services, power and antenna height limits; § 27.53, Miscellaneous Wireless Communications Services, emission limits; § 90.205, Private Land Mobile Radio Services, power and antenna height limits; § 90.210, Private Land Mobile Radio Services, emission masks; § 90.219, Private Land Mobile Radio Services, use of signal boosters; and § 90.247, Private Land Mobile Radio Services, mobile repeater stations.

(c) Signal boosters operated in portable RF exposure conditions as described in § 2.1093 that are designed to be used so that the radiating structure(s) is/are within 20 centimeters of the user or other persons are prohibited.

§ 95.1613 Operator responsibility.

(a) The operator of a signal booster must comply with all applicable rules in this part and any other applicable part under this chapter. The operator is the person or persons with control over the functioning of the signal booster, or the person or persons with the ability to deactivate it in the event of technical malfunctioning or harmful interference to a primary radio service.

(b) Failure to comply with all applicable rules in this subpart and all applicable technical rules for the frequency band(s) of operation voids the authority to operate a signal booster.

§ 95.1615 Operation on a secondary, non-interfering basis.

Operation of signal boosters under this subpart is on a secondary, non-interference basis to primary services licensed for the frequency bands on which they transmit, and to primary services licensed for the adjacent frequency bands that might be affected by their transmissions.

(a) The operation of signal boosters must not cause harmful interference to the communications of any primary licensed service.

(b) If an FCC representative directs the operator to deactivate the signal booster, the operator must deactivate the booster immediately, or as soon as practicable, if immediate deactivation is not possible.

§ 95.1617 Authorized locations.

Unless otherwise specified in this chapter, signal boosters may be operated in any location where CB stations may be operated under § 95.405.

§ 95.1619 Fixed Signal Booster Coordination.

Prior to commencing operation of a signal booster at a fixed location, an operator must also coordinate frequency selection and power levels with each licensee or lessee authorized to operate on the frequencies in the registered area of operation.

§ 95.1621 Frequency bands.

Signal boosters may be operated on frequencies used for the provision of subscriber-based services under parts 22, 24, 27, and 90 of this chapter.

§ 95.1623 Interference safeguards.

Signal boosters must include features to prevent harmful interference including, at a minimum, those enumerated in this section. These features may not be deactivated by the operator and must be enabled and operating at all times the signal booster is in use.

(a) *Self-monitoring*. Signal boosters must automatically self-monitor their operation to ensure compliance with all applicable technical parameters and shut down automatically within 10 seconds (or less) if their operation exceeds any of those parameters. A signal booster must remain off for a minimum of 60 seconds before restarting. If after 5 restarts, a device is still not operating in compliance with all applicable technical parameters, it must shut off and not resume operation until manually reset.

(b) *Feedback or oscillation.* Signal boosters must be able to detect feedback or oscillation (such as may result from insufficient isolation between the antennas) and deactivate the uplink transmitter within 10 seconds of detection. After such deactivation, the booster must not resume operation until manually reset.

(c) *Mobile signal boosters*. Signal boosters operated in a mobile environment must automatically power down or cease amplification as they approach the base station with which they are communicating.

§ 95.1625 Labeling requirements.

Signal booster manufacturers, distributors, and retailers must ensure that all signal boosters marketed on or after [insert date six months after the effective date of this rule] include the following advisories in 12-point or greater typeface (1) in any marketing materials, (2) in the owner's manual, (3) on the outside packaging of the device, and (4) on a label affixed to the device:

> WARNING. Operation of this device is on a secondary non-interference basis and must cease immediately if requested by the FCC or a licensed wireless service provider.

In addition to the above, signal boosters intended for fixed operation must include the following advisory in 12-point or greater typeface (1) in any marketing materials, (2) in the owner's manual, (3) on the

outside packaging of the device, and (4) on a label affixed to the device:

> WARNING. Operation of this device must be coordinated with, and information on channel selection and operating power must be obtained from, the applicable spectrum licensees authorized in the area of deployment. Licensee information is available at www.fcc.gov/signalboosters.

§ 95.1627 RF Exposure.

(a) Signal boosters are subject to the radio frequency radiation exposure requirements specified in sections 1.1307(b) and 2.1091 of this chapter. Signal boosters operating in fixed and mobile exposure conditions are subject to routine environmental evaluation pursuant to the above sections. Applications for equipment authorization of signal boosters with respect to 1.1307(b) and 2.1091 must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions; and technical information showing the basis for this statement must be submitted to the Commission upon request.

(b) Signal boosters operated in portable RF exposure conditions as described in § 2.1093 that are designed to be used so that the radiating structure(s) is/are within 20 centimeters of the user or other persons are prohibited.

APPENDIX B

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[1] the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities small entities by the policies and rules proposed in this *Notice of Proposed Rulemaking* (*NPRM*). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the *NPRM* provided in Section V.F.2. of the item. The Commission will send a copy of the *NPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[2] In addition, the *NPRM* and IRFA (or summaries thereof) will be published in the Federal Register.[3]

A. Need for, and Objectives of, the Proposed Rules

2. The regulatory framework for signal boosters proposed in this *NPRM* is one element in a set of initiatives designed to promote deployment of mobile voice and broadband services in the United States. Well-designed, properly operating, and properly installed signal boosters have the potential to improve consumers' wireless network coverage without harming commercial, private, and public safety wireless network performance. Malfunctioning, poorly designed, or improperly installed signal boosters, however, may harm consumers by blocking calls, including E-911 and other emergency calls, and decreasing network coverage and capacity. The regulatory framework proposed in this *NPRM* seeks to create appropriate incentives for carriers and manufacturers to collaboratively develop robust signal boosters that do not harm wireless networks. This, in turn, will empower consumers to improve their cell phone coverage as they deem necessary. The public interest is best served by ensuring that consumers have access to well-designed boosters that do not harm wireless networks.

3. The *NPRM* proposes a new regulatory framework authorizing the operation of "consumer signal boosters"[4] provided the devices (1) comply with all applicable technical rules, and (2) comply with a set of parameters aimed at preventing and controlling interference and rapidly resolving interference problems should they occur. We also propose certain revisions to our service rules in Part 90.

B. Legal Basis

4. The proposed action is authorized under Sections 4(i), 4(j), 301, 303(r), and 307 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 154(j), 301, 303(r), 307.

C. Description and Estimate of the Number of Small Entities To Which the Proposed Rules Will Apply

[1] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §§ 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[2] *See* 5 U.S.C. § 603(a).

[3] *See* 5 U.S.C. § 603(a).

[4] We define the term "consumer signal booster" in this *NPRM* to include any signal booster operated by (or for the benefit of) consumers on spectrum being used to provide subscriber-based services, *e.g.,* voice communications, texting, using a broadband connection to access email or the Internet.

5. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[5] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[6] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[7] A small business concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.[8]

6. Nationwide, there are a total of approximately 29.6 million small businesses, according to the SBA.[9] A "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[10] Nationwide, as of 2002, there were approximately 1.6 million small organizations.[11] The term "small governmental jurisdiction" is defined generally as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[12] Census Bureau data for 2002 indicate that there were 87,525 local governmental jurisdictions in the United States.[13] We estimate that, of this total, 84,377 entities were "small governmental jurisdictions."[14] Thus, we estimate that most governmental jurisdictions are small.

7. *Wireless Telecommunications Carriers (except Satellite)*. Since 2007, the Census Bureau has placed wireless firms within this new, broad, economic census category.[15] Prior to that time, such firms were within the now-superseded categories of "Paging" and "Cellular and Other Wireless Telecommunications."[16] Under the present and prior categories, the SBA has deemed a wireless business

[5] 5 U.S.C. § 603(b)(3).

[6] 5 U.S.C. § 601(6).

[7] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register." 5 U.S.C. § 601(3).

[8] Small Business Act, 15 U.S.C. § 632 (1996).

[9] *See* SBA, Office of Advocacy, "Frequently Asked Questions," http://web.sba.gov/faqs/faqindex.cfm?areaID=24 (revised Sept. 2009).

[10] 5 U.S.C. § 601(4).

[11] Independent Sector, The New Nonprofit Almanac & Desk Reference (2002).

[12] 5 U.S.C. § 601(5).

[13] U.S. Census Bureau, Statistical Abstract of the United States: 2006, Section 8, page 272, Table 415.

[14] We assume that the villages, school districts, and special districts are small, and total 48,558. *See* U.S. Census Bureau, Statistical Abstract of the United States: 2006, section 8, page 273, Table 417. For 2002, Census Bureau data indicate that the total number of county, municipal, and township governments nationwide was 38,967, of which 35,819 were small. *Id.*

[15] U.S. Census Bureau, 2007 NAICS Definitions, "517210 Wireless Telecommunications Categories (Except Satellite)"; http://www.census.gov/naics/2007/def/ND517210.HTM#N517210.

[16] U.S. Census Bureau, 2002 NAICS Definitions, "517211 Paging"; http://www.census.gov/epcd/naics02/def/NDEF517.HTM.; U.S. Census Bureau, 2002 NAICS Definitions, "517212 Cellular and Other Wireless Telecommunications"; http://www.census.gov/epcd/naics02/def/NDEF517.HTM.

to be small if it has 1,500 or fewer employees.[17] Because Census Bureau data are not yet available for the new category, we will estimate small business prevalence using the prior categories and associated data. For the category of Paging, data for 2002 show that there were 807 firms that operated for the entire year.[18] Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.[19] For the category of Cellular and Other Wireless Telecommunications, data for 2002 show that there were 1,397 firms that operated for the entire year.[20] Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of 1,000 employees or more.[21] Thus, we estimate that the majority of wireless firms are small.

8. The Commission has determined that there are approximately 241,237 licensees in the Wireless Radio Services affected by this *NPRM*, as of October 1, 2010; the Commission does not know how many licensees in these bands are small entities, as the Commission does not collect that information for these types of entities. Thus, the Commission assumes, for purposes of this IRFA, that all prospective licensees are small entities as that term is defined by the SBA or by our proposed small business definitions for these bands.

9. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* The Census Bureau defines this category as follows: "This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment."[22] The SBA has developed a small business size standard for firms in this category, which is: all such firms having 750 or fewer employees.[23] According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.[24] Of this total, 1,010 had employment of under 500, and

[17] 13 C.F.R. § 121.201, NAICS code 517210 (2007 NAICS). The now-superseded, pre-2007 C.F.R. citations were 13 C.F.R. § 121.201, NAICS codes 517211 and 517212 (referring to the 2002 NAICS).

[18] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization," Table 5, NAICS code 517211 (issued Nov. 2005).

[19] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[20] U.S. Census Bureau, 2002 Economic Census, Subject Series: Information, "Establishment and Firm Size (Including Legal Form of Organization," Table 5, NAICS code 517212 (issued Nov. 2005).

[21] *Id.* The census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[22] U.S. Census Bureau, 2007 NAICS Definitions, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing"; http://www.census.gov/naics/2007/def/ND334220.HTM#N334220..

[23] 13 C.F.R. § 121.201, NAICS code 334220.

[24] U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); http://factfinder.census.gov. The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

an additional 13 had employment of 500 to 999.[25] Thus, under this size standard, the majority of firms can be considered small.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

10. In the *NPRM,* the Commission seeks comment on rules and policies that will broaden the availability and use of signal boosters to enhance wireless coverage for consumers, particularly in rural and underserved areas, while ensuring that boosters do not adversely impact wireless networks. The *NPRM* proposes to authorize individuals to use fixed and mobile consumer signal boosters by rule under Part 95.

11. Under the Commission's proposal, all consumer signal boosters must comply with technical and operational requirements aimed at preventing interference to wireless networks, including: complying with technical parameters (*e.g.,* power and unwanted emission limits) for the applicable spectrum band as well as RF exposure requirements for the type of device; automatically self-monitoring operations and shutting down if not in compliance with our technical rules; and for mobile boosters, powering down, or shutting down, automatically when a device is not needed, such as when the device approaches the base station with which it is communicating. The *NPRM* also proposes to require manufacturers to market and label consumer signal boosters in a way that provides consumers with clear information specifying the legal use of the device.

12. In order to facilitate the near-term availability of new, compliant consumer signal boosters, the Commission proposes to require applications for equipment authorization to demonstrate compliance with the new rules within 30 days of their effective date. Further, the Commission proposes to require that devices marketed or sold in the United States comply with the new rules within 6 months of their effective date.

13. In addition, under the Commission's proposal, operators of consumer signal boosters would be required to immediately cease operations upon notification by a licensee or the Commission that the device causes harmful interference to wireless network operations. Further, operators of boosters operated at a fixed location, such as in a building, tunnel or garage, would be required to coordinate frequency selection and power levels with the applicable wireless carrier(s) prior to operation.

14. With respect to Part 90 PLMR, non-consumer, signal boosters operated by licensees, the *NPRM* proposes revisions to the technical and operational requirements aimed at preventing interference. Specifically, the Commission proposes to retain the Class A (narrowband) and Class B (wideband) regulatory distinctions and permit private land mobile fixed (Class A and B) and mobile (Class A only) devices. In addition, the *NPRM* proposes to make clear that Class B devices must be limited to confined areas such as buildings, tunnels, parking structures, etc., but permits use of external antennas to communicate with base stations.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

15. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): "(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance, rather than design standards; and (4) an exemption from coverage of

[25] *Id*. An additional 18 establishments had employment of 1,000 or more.

the rule, or any part thereof, for small entities."[26]

16. The *NPRM* specifically invites comments on a range of potential safeguards for signal boosters and invites interested parties to suggest alternative proposals. At this time, the Commission has not excluded any alternative proposal concerning potential signal booster safeguards from its consideration, but it would do so in this proceeding if the record indicates that a particular proposal would have a significant and unjustifiable adverse economic impact on small entities.

17. In the *NPRM*, the Commission also discusses possible registration requirements with a national signal booster clearinghouse to facilitate rapid resolution of interference (in the event harmful interference occurs notwithstanding the Commission's proposed safeguards) and ease coordination burdens. However, the Commission will not consider any alternative that would have a significant and unjustifiable adverse economic impact on small entities.

18. The Commission solicits alternative proposals, especially those that would not incur significant and unjustifiable adverse impacts on small entities.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rule

19. None.

[26] 5 U.S.C. § 603(c)(1) – (c)(4).

APPENDIX C

List of Commenters

Comments:

Advanced/PLM Sales & Marketing
Al Nowakowski (Nowakowski)
American Association of State Highway and Transportation Officials
AT&T Inc.
Bassett Sales Corporation
Bill M
Bird Technology Group
Brenton W. MacAloney, Fire Chief, Town of Westminster, MA
Brian Hunt, Yavapai County Sheriff's Office
California Public-Safety Radio Association (CPRA)
CANAM Technology, Inc.
Capitol Electronics
CelLynx Group, Inc. (CelLynx)
Cobb County E-911Communications Bureau (Cobb County E-911)
Co-Meg Sales
CommScope, Inc.
County of San Bernardino
CTIA - The Wireless Association (CTIA)
David Clemons, City of Worcester
Dawn J. Smith
Dick Abbott
Digital Antenna, Inc.
Donald Bigelow
Donald Scharnowske Jr.
Dustin LeRoy
Epic Marketing Co., Inc.
Free Press
George R. Potter, Jr. (Potter)
George Udvary Jr.
GPD Telecom Inc. (GDP)
Greg Stoddard
Gregory T. Bunting, St. Lucie County Department of Public Safety
Harbor Electronics
Howard Melamed
Jack Daniel DBA Jack Daniel Company (Jack Daniel)
Jason Matthews, Lake County Sheriff's Office
Jeff Ireland
John Lewis
King County, Washington Regional Communications Board
Lorra Martens, Martens Farms
Lt. Steve Farmer
Maneesh Pangasa
Mark Morrison
Marty Martello

Massachusetts State Police
Matt Larson - Rochester Minnesota
McLaughlin-Long Marketing, Inc.
Media Access Project
Mel Rivera
Michael C. Candell (Candell)
Modtech Corp.
Motorola, Inc.
National Emergency Number Administration (NENA)
National Public Safety Telecommunications Council (NPSTC)
Nelson Roberts
New America Foundation Open Technology Initiative
Nextivity Inc.
Patrick Becker, Glendale Fire Department
Phoenix Fire Dept.
Phoenix, City of
PMC Associates
Powerwave Technologies, Inc.
Public Knowledge
Pyramid Communications, Inc.
Rajiv Bhardwaj
RepeaterStore.com
RF Industries Pty. Ltd. (RFI)
Secom Systems
Sheriff-Coroner Department, County of Orange, California (Orange County Sheriff-Coroner Department)
Simon Richards
Smart Booster
Sprint Nextel Corporation
Sue Dillard
T. Kent Hill
T. J. Van Iderstine
The Association of Public-Safety Communications Officials - International (APCO)
The Cambridge Group
The DAS Forum (A membership section of PCIA-The Wireless Infrastructure Assn) (DAS Forum)
The Joint Council on Transit Wireless Communications
Tim Beyer
Todd Van Dussen
United States Cellular Corporation (U.S. Cellular)
Verizon Wireless
Wayne Klingelsmith
West Side Volunteer Fire Department
William T. Morris
Wireless Communications Association International, Inc. (WCAI)

In addition, over 525 parties filed brief comments in the docket.

Reply Comments:

ACUTA - The Association for Communications Technology Professionals in Higher Education

AT&T Inc.
Bird Technologies Group
CelLynx Group, Inc. (CelLynx)
Cincinnati Bell Wireless LLC
CTIA - The Wireless Association (CTIA)
Forestry Conservation Communications Association, Inc.
Jack Daniel
Motorola, Inc.
New York City Transit Authority (NYCTA)
Pyramid Communications
QUALCOMM Incorporated
The DAS Forum (A membership section of PCIA-The Wireless Infrastructure Assn) (DAS Forum)
United States Cellular Corporation (U.S. Cellular)
Verizon Wireless
Wilson Electronics, Inc. (Wilson)
Wireless Extenders, Inc.
Ymax Corp.

STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN

Re: 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.

This Notice of Proposed Rulemaking takes a thoughtful and comprehensive approach to promoting the development and deployment of properly designed and installed signal boosters. These devices have demonstrated they can help address the coverage gaps that exist within the wireless service areas in both rural and urban environments. With regard to the issues raised in CTIA's Petition for a Declaratory Ruling, I commend Chairman Genachowski for allowing parties to try to reach a consensus on the technical requirements and procedures that will enable currently available signal boosters to continue to serve the needs of consumers while addressing the interference concerns raised by carriers. As we have seen in other proceedings, such as the one involving E9-1-1 location accuracy standards, industry collaboration tends to serve the interests of consumers better than litigation. I also compliment Ruth Milkman and her staff in the Wireless Telecommunications Bureau for seeking input from the Commissioner Offices as they developed options to resolving the difficult issues in this proceeding.