

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

In the Matter of )  
 )  
Modification of Parts 2 and 15 of the )  
Commission's Rules for unlicensed devices and ) ET Docket No. 03-201  
equipment approval. )

**MEMORANDUM OPINION AND ORDER AND  
FURTHER NOTICE OF PROPOSED RULE MAKING**

**Adopted: June 19, 2007**

**Released: June 22, 2007**

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

**Reply Comment Date: (105 days after date of publication in the Federal Register)**

By the Commission:

**I. INTRODUCTION**

1. By this action, we dismiss two petitions for reconsideration of the rules adopted in the *Report and Order* in this proceeding. Specifically, we dismiss a petition for reconsideration filed by Warren C. Havens and Telesaurus Holdings GB LLC ("Havens") requesting that the Commission suspend the rule changes adopted for unlicensed devices in the 902-928 MHz (915 MHz) band until such time as we complete a formal inquiry with regard to the potential effect of such changes to Location and Monitoring Service (LMS) licensees in the band. We also dismiss a petition for reconsideration filed by Cellnet Technology ("Cellnet") requesting that the Commission adopt spectrum sharing requirements in the unlicensed bands, *e.g.*, a "spectrum etiquette," particularly in the 915 MHz band. We are, however, seeking comment on its recommendations for a spectrum etiquette in a Further Notice of Proposed Rule Making (Further NPRM) in this proceeding. Specifically, the Further NPRM seeks comment on a specific spectrum etiquette for unlicensed transmitters that operate under Sections 15.247 and 15.249 of the rules in the 915 MHz band.

**II. BACKGROUND**

2. Part 15 of the Commission's rules governs the operation of unlicensed radiofrequency devices, including the technical requirements for their use. As a general condition of operation, Part 15 devices may not cause harmful interference to authorized radio services and must accept any interference that they receive.<sup>1</sup> Examples of common Part 15 devices include cordless telephones, wireless local area networking equipment, baby monitors, and garage door openers. Overall, the Part 15 rules have been highly successful in fostering the development of new unlicensed devices while protecting authorized users of the radio spectrum from harmful interference.

3. On July 12, 2004, the Commission released a *Report and Order* in this proceeding.<sup>2</sup> In that *Report and Order*, the Commission modified the Part 15 spread spectrum rules for devices operating in the 2.4 GHz band. Specifically, the Commission allowed the use of advanced antenna technologies with

<sup>1</sup> 47 C.F.R. § 15.5.

<sup>2</sup> See *Report and Order* in ET Docket No. 03-201, 19 FCC Rcd 13539 (2004).

spread spectrum transmitters in the 2.4 GHz band that can enable the provision of service over larger areas with reduced infrastructure costs. It also modified the channel spacing requirements for spread spectrum transmitters in the 2.4 GHz band which will accommodate higher data rates. In addition, the Commission changed the rules to permit manufacturers and system operators to mix various antennas and radio transmitters for unlicensed devices in any frequency band without the need to obtain a separate equipment authorization for every combination. Further, the Commission allowed average output power measurements for digitally modulated spread spectrum devices operating in the 915 MHz, 2.4 GHz and 5.8 GHz frequency bands using the same procedures as Unlicensed National Information Infrastructure (U-NII) devices that disregard short duration peaks that do not cause increased interference to other operations. While the Commission initially sought comment on the possibility of adopting a spectrum etiquette, it specifically declined to do so in the *Report and Order* because the existing unlicensed bands are heavily used.<sup>3</sup> The Commission's concern was that an etiquette requirement that applies to only new devices in a heavily used band may not be useful in facilitating spectrum sharing if the large number of devices already authorized and used in the band were not required to follow the etiquette. The Commission also indicated that it did not believe that it was necessary to require a spectrum etiquette, stating that the current regulations, which do not require a spectrum etiquette, have resulted in very efficient use of unlicensed spectrum.

4. Havens and Cellnet each filed a petition seeking reconsideration of various aspects of the Commission's decisions in the *Report and Order* as they pertain to the 915 MHz band.<sup>4</sup> Itron filed comments in support of Cellnet's petition, while Motorola filed comments in opposition.<sup>5</sup> No comments were filed in response to the Havens petition. These petitions are discussed in detail below.

5. The 915 MHz band is shared by a variety of users under a hierarchy of spectrum usage rights. The band is allocated for primary use by Industrial, Scientific and Medical (ISM) equipment and Federal Government radiolocation systems.<sup>6</sup> Federal Government fixed and mobile services are secondary to both of these primary uses.<sup>7</sup> LMS licensees are next in order of priority and may not cause interference to and must tolerate interference from all Federal Government uses and ISM devices.<sup>8</sup> Amateur radio operations, in turn, are secondary to all Federal Government users and LMS licensees and must accept

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<sup>3</sup> See *Notice of Proposed Rule Making* in ET Docket No. 03-201, 18 FCC Rcd 18910, 18923 and *Report and Order* at 13552.

<sup>4</sup> See Havens petition for reconsideration dated October 7, 2004 and Cellnet petition for reconsideration dated October 7, 2004.

<sup>5</sup> See Itron comments dated December 6, 2004 and Motorola opposition dated December 6, 2004.

<sup>6</sup> See 47 C.F.R. §§ 2.106, 18.301 and 18.111(c). Examples of Government radiolocation systems include high-power military air surveillance radars on aircraft carriers, tracking and telemetry radar systems used in aeronautical flight testing, systems that monitor the positions of missiles, drone and manned aircraft, and land units, and perimeter protection devices for intrusion detection at military facilities. Naval radars use the band because the band's propagation characteristics enable detection of "sea skimmers," fast moving targets over water. The band is also used for radar wind profiling for weather forecasting, aviation warning, marine observations and environmental studies. ISM equipment is defined as "equipment or appliances designed to generate and use radio frequency (RF) energy" to perform some work other than telecommunications. See 47 C.F.R. § 18.107(c). ISM equipment includes industrial heaters that cure glue, inks and rubber, welding equipment, food equipment such as bacon dryers and donut fryers, and medical equipment used for magnetic resonance imaging and diathermy (tissue heating).

<sup>7</sup> Government fixed and mobile radio systems in this band include mobile and portable radios, the transmission of images seen by bomb disposal robots and fixed systems for such purposes as control of power utilities, and video links for monitoring entry points at national borders.

<sup>8</sup> See 47 C.F.R. § 90.353(a).

any interference caused by ISM equipment.<sup>9</sup> Finally, unlicensed devices authorized under Part 15 are not entitled to interference protection from and may not cause harmful interference to any authorized services in the band.<sup>10</sup> Nonetheless, in recognition of the important contributions to the public that both Part 15 technologies and amateur operators provide in the 915 MHz band, the Commission adopted a “safe harbor” provision, whereby unlicensed devices and amateur services operating pursuant to specific Commission technical rules are deemed not to be causing harmful interference to LMS operations.<sup>11</sup> Further, LMS licensees are required to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference to unlicensed devices in this band.<sup>12</sup> The Commission’s rules for spectrum sharing between LMS operations and Part 15 devices in the 915 MHz band were originally adopted in 1995, and were thus known to prospective applicants prior to the M-LMS auctions in 1999 and 2001.<sup>13</sup>

6. There are two types of LMS systems that operate in the 915 MHz band under Part 90 of the rules: non-multilateration systems and multilateration systems. Non-multilateration systems transmit data to and from objects passing through particular locations (*e.g.*, automated tolls, monitoring of railway cars). There are over 2000 non-multilateration LMS sites in operation. Multilateration (M-LMS) systems track and locate objects over a wide geographic area (*e.g.*, tracking a bus fleet) by measuring the difference in time of arrival, or difference in phase, of signals transmitted from a unit to a number of fixed points, or from a number of fixed points to the unit to be located. The Commission auctioned a total of 452 M-LMS licenses which are currently held by six entities. Warren C. Havens and Telesaurus Holdings GB LLC together hold 95 of these licenses. None of the six M-LMS license holders that obtained spectrum through auction are providing any M-LMS service with their spectrum.<sup>14</sup>

7. Spread spectrum transmitters are permitted to operate in the 915 MHz, 2.4 GHz, and 5.8 GHz bands under Section 15.247 of the rules.<sup>15</sup> Operation under these rules is limited to frequency hopping systems and systems using digital modulation. In frequency hopping systems, an information signal, usually a data stream, modulates a radio frequency carrier that is hopped among a number of frequencies in concert with a receiver. Digitally modulated systems must use a minimum bandwidth of 500 kHz but are not required to hop frequencies. There is no maximum bandwidth limit for digitally modulated systems other than the requirement to stay within the designated bands of operation, and there is no limit on the duration of transmissions. Both frequency hopping and digitally modulated systems are permitted to use output powers of up to 1 watt in the above bands, however, most devices use lower power for various design reasons, such as conserving battery life. Spread spectrum modulation reduces the power density of the transmitted signal at any frequency, thereby reducing the possibility of causing interference to other signals occupying the same spectrum. Similarly, at the receiver end, the power density of

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<sup>9</sup> See 47 C.F.R. § 97.301. The amateur radio service under Part 97 of the Commission's Rules provides spectrum for amateur radio service licensees to participate in a voluntary noncommercial communication service which allows experimentation with various radio techniques and technologies to further the understanding of radio use and the development of new technologies. See 47 C.F.R. § 97.1.

<sup>10</sup> Users of Part 15 devices do not have any allocation status in our rules; rather, we make spectrum available for Part 15 devices on an unprotected and non-interference basis. Under Part 15, unlicensed devices may not cause harmful interference to LMS licensees, amateur operations, or other licensed systems in the 902-928 MHz band and are not protected from interference from any source.

<sup>11</sup> See 47 C.F.R. § 90.361.

<sup>12</sup> See 47 C.F.R. § 90.353(d).

<sup>13</sup> See *Report and Order* in PR Docket No. 93-61, 10 FCC Rcd 4695 (1995).

<sup>14</sup> There are two M-LMS licensees operating systems under Part 90 in a small number of markets. These licensees were grandfathered when the LMS rules were adopted in 1995 and neither obtained their spectrum at auction.

<sup>15</sup> 47 C.F.R. § 15.247

interfering signals is minimized, making spread spectrum systems relatively immune to interference from outside sources.

8. Any type of operation is permitted in the 915 MHz, 2.4 GHz and 5.8 GHz bands under Section 15.249 of the rules, subject to the field strength limits in this section.<sup>16</sup> The limit for transmitters in these bands is 50,000 microvolts per meter in-band, and 500 microvolts per meter out-of-band, measured at a distance of three meters. This in-band signal level is nearly 100 times lower than the maximum level permitted for spread spectrum transmitters.<sup>17</sup> There are no requirements for devices operating under Section 15.249 to hop frequencies or use a minimum transmit bandwidth, and there are no maximum bandwidth or transmission duration limits. Many types of devices operate under this rule section including cordless telephones, video transmitters, wireless speaker and headphone systems, and automated utility meter reading equipment.

### III. MEMORANDUM OPINION AND ORDER

9. Havens Petition. Havens requests that the Commission suspend the rule changes adopted in this docket for unlicensed devices in the 915 MHz band until such time as the Commission completes a formal inquiry with regard to the potential effect of such changes to M-LMS licensees in the band and it determines either that there will be no material adverse effects or that it will allow counterbalancing changes (e.g., waivers or forbearance of LMS rules) to maintain the balance between higher power LMS systems and unlicensed devices. Havens does not specify which particular rule changes it believes should be suspended. In support of this request, Havens asserts that it cannot “efficiently or effectively” comply with rule Section 90.353(d) which requires that M-LMS licensees design, construct and field test their systems to minimize adverse effects on Part 15 devices if unlicensed devices operating in the band change as a result of the new rules adopted in the *Report and Order*. It claims that the new rules will lead to increased spectrum use of the 915 MHz band by unlicensed devices and thus will adversely affect M-LMS systems by changing the “regulatory coexistence” between Part 15 and LMS operations (i.e., the balance of aggregate M-LMS systems and aggregate unlicensed devices) and by altering the premise of the “safe harbor” in rule section 90.361 (i.e., that unlicensed devices would not operate in close proximity to M-LMS). Havens further alleges that the Part 15 rule changes violate Section 15.5 of the rules, which requires that unlicensed devices not interfere with licensed system operations.

10. *Decision*. We decline to suspend the Part 15 rule changes adopted in the *Report and Order* or consider modifying the M-LMS rules as requested by Havens. We first note that Havens did not raise any objections to any proposals in the *Notice* during the pendency of this proceeding. A petition for reconsideration that relies on facts not previously presented to the Commission will be granted only if: 1) the facts relied on relate to events which have occurred or circumstances which have changed since the last opportunity to present them to the Commission; 2) the facts relied upon were unknown to the

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<sup>16</sup> See 47 C.F.R. § 15.249. The 5.8 GHz band differs slightly between Sections 15.247 and Sections 15.249. Under Section 15.247, operation is permitted in the band 5725-5850 MHz, and under Section 15.249, operation is permitted in the band 5725-5875 MHz.

<sup>17</sup> A spread spectrum system is generally permitted to operate with no greater than 1 watt of power into an antenna with a gain of 6 dBi. If the maximum antenna gain exceeds 6 dBi, the transmitter power must be reduced by the amount in dB that the maximum antenna gain exceeds 6 dBi. A transmitter operating with these parameters would produce a field strength of 4,472 millivolts per meter at a distance of 3 meters. A device operating under Section 15.249 is permitted a maximum field strength of 50 millivolts per meter at a distance of 3 meters, which is 89 times lower than a spread spectrum transmitter. Spread spectrum systems in the 2.4 GHz and 5.8 GHz bands that are used for fixed point-to-point operation can operate with higher signal levels than other spread spectrum transmitters because the transmitter power is not required to be reduced by one dB for every dB that the antenna gain exceeds 6 dBi. For fixed point-to-point operation in the 2.4 GHz band, the transmitter power is required to be reduced by only one dB for every three dB that the maximum antenna gain exceeds 6 dBi, and for fixed point-to-point operation in the 5.8 GHz band there is no requirement to reduce transmitter power regardless of the gain of the transmit antenna.

petitioner until after his last opportunity to present them to the Commission, and he could not through the exercise of due diligence have learned of the facts in question prior to such opportunity; or 3) the Commission determines that consideration of the facts relied on is required in the public interest.<sup>18</sup> Havens does not address why it did not previously participate in this proceeding or claim that any of these three conditions are met in this case.

11. The Commission's rules also require that a petition for reconsideration state with particularity the respects in which the petitioner believes the action taken should be changed.<sup>19</sup> We note that the Commission modified several Part 15 rules that apply to unlicensed devices that may operate in the 915 MHz band, in addition to other frequency bands. Havens does not identify the particular rule changes that it believes should be suspended. Havens provides only a mere statement of belief that the rule changes in this proceeding will lead to increased use of Part 15 devices in the 915 MHz band and thus will result in adverse effects on M-LMS operations. It provides no evidence or analysis to support this assertion. Finally, we note that Havens raised essentially the same arguments in its petition for reconsideration in ET Docket No. 99-231 concerning changes to the Part 15 rules for spread spectrum devices.<sup>20</sup> The Commission rejected these same arguments in that proceeding.<sup>21</sup> Accordingly, we dismiss the Havens petition.

12. The Commission recently initiated a proceeding to reexamine the rules for the M-LMS operating in the 904-909.75 MHz and 919.75-928 MHz portion of the 915 MHz band.<sup>22</sup> That proceeding was originated by the Commission partly in response to a 2002 petition for rule making filed by Progeny LMS, LLC requesting changes to these rules. That proceeding is the appropriate forum for Havens to address its concerns about the M-LMS rules, including the "safe harbor" rule regarding the operational relationship between Part 15 unlicensed devices and Part 90 M-LMS devices.<sup>23</sup>

13. Cellnet Petition. In the *Notice*, the Commission invited comment on whether it should consider any methods to ensure efficient spectrum usage by unlicensed devices and pointed to the spectrum etiquette, or sharing conditions, developed by the industry for the operation of unlicensed PCS devices operating in the 1920-1930 MHz band under Part 15 of its rules as one possible approach.<sup>24</sup> A spectrum etiquette establishes a set of steps and protocols that a device must follow before it may access the spectrum.<sup>25</sup> Such an etiquette may require that a device monitor the spectrum in which it intends to

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<sup>18</sup> See 47 C.F.R. § 1.429(b).

<sup>19</sup> See 47 C.F.R. § 1.429(c).

<sup>20</sup> See *Second Report and Order* in ET Docket No. 99-231, 17 FCC Rcd 10755 (2002). Havens filed a petition for reconsideration of the Commission's actions in that *Report and Order* on July 25, 2002.

<sup>21</sup> See *Memorandum Opinion and Order* in ET Docket No. 99-231, 18 FCC Rcd 11661 (2003). Havens subsequently filed an appeal of the Commission's denial of its petition for reconsideration with the United States Court of Appeals for the District of Columbia Circuit, *Warren C. Havens v FCC & USA*, No. 03-1247. Havens has requested that the Court defer action on that case pending resolution of its petition for reconsideration in this proceeding.

<sup>22</sup> See *Amendment of the Commission's Part 90 Rules in the 904-909.75 and 919.75-928 MHz Bands, Notice of Proposed Rulemaking* in WT Docket No. 06-49, 21 FCC Rcd 2809 (2006).

<sup>23</sup> In response to the petition for rule making filed by Progeny LMS, LLC on March 5, 2002 entitled "Amendment of Part 90 of the Commission's Rules Governing the Location and Monitoring Service to Provide Greater Flexibility", RM-10403, Havens has submitted numerous filings, including comments dated May 15, 2002 and reply comments dated June 3, 2002.

<sup>24</sup> See 47 C.F.R. Part 15, Subpart D – Unlicensed Personal Communications Service Devices.

<sup>25</sup> See 47 C.F.R. §§ 15.319, 15.321 and 15.323.

operate and begin transmission only if no signal above a specified threshold is detected.<sup>26</sup> The Commission invited comment on a number of issues regarding the possibility of implementing a spectrum sharing etiquette for devices that operate on an unlicensed basis in bands other than the unlicensed PCS band, including who should develop any such etiquette, the bands to which an etiquette would apply, and how effective an etiquette imposed on new entrants would be in improving spectrum sharing. In the *Report and Order*, the Commission declined to impose any type of spectrum etiquette for any of the Part 15 bands that are the subject of this proceeding.

14. In its petition, Cellnet requests reconsideration of the Commission's decision not to adopt a spectrum etiquette for unlicensed devices. Cellnet produces equipment for the automated reading of gas, water, and electric meters that uses spread spectrum transmitters operating on an unlicensed basis in the 915 MHz band.<sup>27</sup> It states that the Commission should: 1) adopt a duty cycle limitation and other effective spectrum etiquette for any newly certified devices using digital modulation that operate in the 915 MHz band, and 2) confirm in a public notice the obligation of all operators of unlicensed devices in this band authorized under Part 15 to avoid causing harmful interference to licensed and unlicensed devices operating in the band and to work cooperatively with operators of any other devices that may be experiencing interference to resolve any such incidents. Cellnet states that these actions are necessary to assure that users taking advantage of newly authorized technical flexibility in this heavily encumbered band do not create the type of interference that will deny the continued effective use of this band by existing and future users. It submits that prior to the Commission's adoption of the new rules on which new entrants have relied on to operate at higher power and without effective duty cycles, the few problems that arose among devices operating in the band were readily resolved with cost effective engineering solutions by affected manufacturers and users. Cellnet states that it did not file comments on this issue in response to the *Notice of Proposed Rule Making* in this docket<sup>28</sup> because it did not believe at the time that a government-imposed spectrum etiquette was necessary. It states that it has seen an increase in the number of digitally modulated devices using the 915 MHz band over the past year, including devices operating without any duty cycle limitation, and now believes that these devices present a threat of interference that requires Commission action. Cellnet also states that these devices operate at the maximum permitted limits without regard to the Part 15 requirements to use good engineering design, suppress emissions as much as practicable, and use the minimum field strength necessary and the maximum attenuation of unwanted emissions. It further states that as a result, new entrants to the band are creating emissions at interfering levels that are virtually unavoidable by incumbent devices, no matter how well the incumbent devices may have been designed to operate in the presence of other low power users. Cellnet states that the absence of any duty cycle limitation on digitally modulated devices threatens to destroy the effective use of the band in many areas where newly installed systems are operating continuously at power levels and across bandwidths that simply cannot be avoided by incumbent transceivers.

15. Itron filed comments in support of Cellnet's petition. Itron also believes that the Commission should require digitally modulated devices to employ duty cycle limits and/or an appropriate spectrum etiquette in the 915 MHz band. It states that this band was initially populated with low power devices, many with limited duty cycles, but that recently, digitally modulated devices are entering the band with maximum power and "always on" duty cycles. It submits that these new devices have limited compatibility with existing users. Itron states that rule changes requiring a spectrum etiquette would allow users to take advantage of the propagation characteristics of the band while protecting incumbent users.

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<sup>26</sup> See 47 C.F.R. § 15.321(c)(1) – (7).

<sup>27</sup> See Cellnet petition at footnote 1.

<sup>28</sup> See *Notice* at 18923.

16. Motorola opposes Cellnet's Petition for reconsideration. It states that spectrum etiquette and duty cycle limitations would have a negligible impact on the RF environment of unlicensed operations given the current crowded use of this band by licensed, ISM, and unlicensed devices. Motorola claims that the risk of interference to unlicensed devices from other Part 15 devices is less than the risk of interference from high-powered licensed and ISM operations. It believes that additional regulatory burdens would not promote design flexibility or provide the ability to develop expanded unlicensed wireless applications and that there is a risk that spectrum etiquette and duty cycle requirements in the 915 MHz band would stifle unlicensed product development and innovations and would outweigh any unproven benefits. In its reply, Cellnet states that Motorola is developing equipment that takes full advantage of maximum permitted Part 15 technical limits and therefore provides an even more compelling reason to adopt a regulatory etiquette or duty cycle limit for future viability of the band. Cellnet also states that Motorola does not address the intolerance of currently operating devices against devices operating at continuous maximum power levels, with essentially 100% duty cycle, and antennas located at the tallest available height.<sup>29</sup>

17. The Commission's rules require that a petition for reconsideration and any supplement thereto shall be filed within thirty days from the date of public notice of such action.<sup>30</sup> Further, the petition must state with particularity the respects in which the petitioner believes the action taken should be changed.<sup>31</sup> Cellnet's petition does not describe any specific rule changes that it wishes the Commission to make. It simply requests that we adopt "a duty cycle limitation and other effective spectrum etiquette," but does not recommend any specific duty cycle limitation or provide any technical details of what it believes would constitute an "effective spectrum etiquette." After the 30 day reconsideration period, Cellnet made an *ex-parte* presentation to the Commission's staff describing a spectrum etiquette that it believes the Commission should require for digitally modulated spread spectrum transmitters operating in the 915 MHz band under Section 15.247 of the rules.<sup>32</sup> Because Cellnet's petition and subsequent filings do not satisfy the Commission's rules for specific relief and timeliness, we dismiss its petition. Although we are dismissing its petition, we are seeking comment on ideas for a spectrum etiquette in the 915 MHz band, including those suggested by Cellnet, in a Further Notice of Proposed Rule Making, discussed below. This action will allow us to fully consider Cellnet's suggestion to develop a spectrum etiquette that is a trade-off between transmission duration and output power, and also to address certain related issues that Cellnet did not discuss such as transition dates by which new equipment would have to comply.

#### IV. FURTHER NOTICE OF PROPOSED RULE MAKING

18. By this Further NPRM, we seek comment on whether there is a need to require unlicensed transmitters operating in the 915 MHz band under Sections 15.247 and 15.249 of the rules to comply with a spectrum etiquette requirement, and the impact that requiring an etiquette would have on the development and operation of unlicensed 915 MHz devices operating under those rule sections. As an initial matter, we also seek comment on the particular etiquette suggested by Cellnet that would require digitally modulated spread spectrum transmitters operating in the 915 MHz band under Section 15.247 of the rules to operate at less than the 1 Watt maximum power if they are continuously silent less than 90% of the time within a 0.4 second interval. This etiquette would require that the maximum permitted power

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<sup>29</sup> Cellnet refers to continuous transmissions as having zero duty cycle, although such transmissions are more commonly referred to as having a duty cycle of 100%.

<sup>30</sup> 47 C.F.R. § 1.429 (d).

<sup>31</sup> 47 C.F.R. § 1.429 (c).

<sup>32</sup> See Cellnet letter dated March 28, 2006. Cellnet recommended a trade-off between transmission duration and output power, i.e., reduced power for transmitters that are continuously silent less than 90% of the time between transmissions. The power limit would range from 30 dBm (1 Watt) for transmitters that are continuously silent at least 90% of the time between transmissions within a 0.4 second window, down to 0 dBm (1 milliwatt) for transmitters with no silent interval between transmissions, i.e., operating continuously.

level decrease in accordance with a specified formula as the silent interval between transmission decreases. We further seek comment on alternatives to the etiquette suggested by Cellnet.

19. *Need for a spectrum etiquette.* The Commission concluded in the *Report and Order* that design flexibility has helped industry to develop efficient sharing and modulation schemes and that the existing regulations with no etiquette requirements have resulted in very efficient use of available unlicensed spectrum.<sup>33</sup> However, we note Cellnet's observations regarding emerging products and its concern that digitally modulated 915 MHz devices operating under Section 15.247 have no duty cycle limitation and may therefore transmit continuously at the maximum power permitted by the rules. Additionally, we observe that there is no limitation on the maximum transmit bandwidth for digitally modulated 915 MHz devices other than the requirement to maintain the fundamental emissions within the authorized band of operation.<sup>34</sup> Thus, there appears to be a potential for a digitally modulated device or a group of digitally modulated devices to essentially occupy the entire 915 MHz band, leaving little or no opportunity for other devices to gain access to the spectrum. We believe that this has not been a problem in the past because the majority of spread spectrum devices operate at less than the maximum output power permitted in the rules to conserve battery power or because higher power is not necessary in many applications. Also, most spread spectrum devices that have been on the market in this band do not occupy the entire band simultaneously. However, as Cellnet and Itron observe, recently there has been increased use of the unlicensed 915 MHz band by parties providing wireless broadband services. These applications require operation at higher power and greater bandwidth than other unlicensed devices to provide service to users. While we encourage the provision of wireless broadband service to all Americans, we recognize that there is the potential under our rules for some unlicensed devices to preclude the operation of other unlicensed devices. We believe it is now appropriate for us to consider whether there is a need for a spectrum etiquette for unlicensed operation in the 915 MHz band. However, we recognize Motorola's concern about the potential for a spectrum etiquette to limit design flexibility and stifle unlicensed product development and innovation. We therefore seek to balance the concerns about the co-existence of different types of unlicensed devices with the concerns about inhibiting unlicensed device innovation in determining whether a spectrum etiquette is necessary and the form that an etiquette would take.

20. The Commission used the term "spectrum etiquette" in the *Notice* to refer to a set of requirements to enable better sharing of spectrum between devices. The Commission cited the unlicensed personal communication services (UPCS) rules as an example of a spectrum etiquette.<sup>35</sup> These rules contain a "listen-before-talk" requirement for UPCS devices to monitor spectrum to ensure that it is not being used before transmitting.<sup>36</sup> However, a spectrum etiquette could be comprised of other requirements that enable better sharing of spectrum, such as trade-offs between the transmission duty cycle, output power and bandwidth to enable more devices to co-exist within the same band of spectrum.

21. We seek comment on whether we should adopt a spectrum etiquette for unlicensed 915 MHz devices operating under Sections 15.247 and 15.249 of the rules. In considering the need for an etiquette, our intent is not to establish interference protection rights for unlicensed devices or to ensure that

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<sup>33</sup> See *Report and Order* at 13552.

<sup>34</sup> Spread spectrum devices have been permitted to operate in the 915 MHz band with a 1 watt power limit and no transmit duty cycle or maximum bandwidth requirements since the spread spectrum rules were first established in 1985. See *First Report and Order* in GEN Docket No. 81-413, 1 FCC 2nd 419 (1985), 58 RR 2nd 251 (1985). In 2002, the Commission modified the spread spectrum rules to allow other types of digital modulation, but made no changes to the maximum output power limit and did not place any limits on the transmit duty cycle or maximum bandwidth. See *Report and Order* in ET Docket No. 99-231, 17 FCC Rcd 10755 (2002).

<sup>35</sup> See *Notice* at 18923.

<sup>36</sup> See 47 C.F.R. §15.323.



unlicensed devices are always able to operate without interference. Rather, our goal is to ensure that the different types of unlicensed devices that operate in a band have an opportunity for spectrum access. We specifically seek comment on Cellnet's contention that digitally modulated devices in the 915 MHz band that transmit continuously at maximum power and occupy wide bandwidths are creating emissions at levels that can cause interference to incumbent devices, irrespective of how well the incumbent devices may have been designed to operate in the presence of other users. In this regard, we seek comment on the tolerance of currently operating devices to emissions from other devices in the same frequency band. We also seek comment on how effective an etiquette would be in improving spectrum sharing between unlicensed devices in the 915 MHz band. We further seek comment about the potential for a spectrum etiquette to limit design flexibility and stifle unlicensed product innovation.

22. *Cellnet's suggested etiquette requirements.* We believe that the general approach to a 915 MHz spectrum etiquette recommended by Cellnet that would limit unlicensed devices that operate under Sections 15.247 and 15.249 with a high duty cycle to lower power is one possible way to enable more efficient spectrum sharing among unlicensed devices. We therefore seek comment on Cellnet's proposed requirement that digitally modulated 915 MHz spread spectrum devices with a continuous silent interval of less than 90% within a 0.4 second window (0.36 seconds) operate with a lower power level than the 30 dBm (1 Watt) maximum currently permitted by the rules. Specifically, the maximum permitted power would range from 30 dBm (1 Watt) when there is a continuous silent interval of at least 90% between transmissions, down to 0 dBm (0.001 Watt) when there is no silent interval between transmissions, with the power limit in dBm linearly interpolated between the 90% silent and continuous operation duty cycle values. These recommended requirements could ensure that devices operating at high power levels leave a silent interval between transmissions that would provide an opportunity for other devices to transmit, and would prevent a high power device from operating continuously and precluding operation of other devices within a band. Devices that operate with shorter silent intervals between transmissions would be required to operate at less than the one watt maximum power to offset the increased interference potential of the longer duration transmissions. The decreasing power output limit would reduce the range at which interference can occur, thus increasing the likelihood that other devices could co-exist with them. The minimum power level of 0 dBm (0.001 Watt) that Cellnet recommends for devices that transmit continuously is comparable to the maximum level permitted for devices operating under Section 15.249.<sup>37</sup>

23. We seek comment on whether this type of spectrum etiquette is appropriate to enable more efficient sharing of spectrum between unlicensed 915 MHz devices and, if so, whether the suggested power levels and duty cycles are appropriate. We also seek comment on whether an alternative type of etiquette would be more appropriate. For example, should an etiquette include limitations on the frequency range or bandwidth that a digitally modulated device may occupy and/or a "listen-before-talk" requirement? Parties who believe that alternative approaches to an etiquette or different power levels are more appropriate are requested to supply specific technical details and justification for their recommendations. In addition, we seek comment on the impact an etiquette like the one suggested by Cellnet would have on other devices that operate in the 915 MHz band or other bands where it may be applied. For example, would manufacturers have to redesign or cease marketing certain equipment if all equipment in a band were required to comply with an etiquette? If so, what particular types of equipment would be affected?

24. Also, if we were to require a spectrum etiquette for the 915 MHz band, we seek comment on whether there would be a need to prohibit the synchronization of transmissions from multiple devices in a

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<sup>37</sup> A digitally modulated spread spectrum transmitter operating at the minimum power under the proposed etiquette (0.001 Watts) and using a 6 dBi gain antenna would produce a field strength of 141 millivolts per meter at 3 meters, as compared to 50 millivolts per meter at 3 meters for devices operating under Section 15.249. The ratio of field strengths is less than 3 to 1, as compared to a ratio of 89 to 1 when a spread spectrum transmitter is operating at the maximum 1 Watt power.

system or otherwise under control of the same party in such a way as to more fully occupy the silent intervals between transmissions. Permitting synchronized transmissions of this nature could allow a group of devices to transmit essentially continuously, thus defeating the purpose of a spectrum etiquette.

25. We seek comment on whether a device operating under such a spectrum etiquette should be permitted to automatically change the power level and duty cycle at which it operates, or if the device should be required to operate using only one fixed duty cycle/power level combination. Could allowing automatic adjustments of the power level and duty cycle encourage efficient spectrum sharing between unlicensed devices since there is incentive to use only the transmit power necessary for the desired output data rates?

26. *Applicability of etiquette.* Cellnet recommends applying an etiquette only to digitally modulated devices operating under Section 15.247 of the rules.<sup>38</sup> We seek comment on the types of devices to which an etiquette should apply. For example, is an etiquette necessary for frequency hopping spread spectrum transmitters operating under Section 15.247? We note that these transmitters have channel separation requirements and continually hop between a number of different channels, and that Section 15.247(h) prohibits the synchronized hopping by a group of spread spectrum transmitters. These requirements would appear to obviate the need for an etiquette for frequency hopping spread spectrum transmitters. Is an etiquette necessary for devices operating under Section 15.249 that are permitted maximum field strength levels that are significantly less than the maximum permitted output for spread spectrum transmitters? We also seek comment on whether requiring an etiquette for digitally modulated transmitters but not frequency hopping transmitters would place digitally modulated transmitters at operational or other disadvantages.

27. We note that the 915 MHz band is the only one where a co-existence problem between unlicensed devices has been raised. However, we recognize that unlicensed use of the 2.4 GHz and 5.8 GHz bands is also continuing to increase. These bands are used by many types of unlicensed devices, including cordless telephones and wireless broadband networking equipment. We are aware that industry standards such as Wi-Fi, Bluetooth, and ZigBee have been developed for the various unlicensed frequency bands and these standards are designed to facilitate sharing among multiple unlicensed devices. The Commission has no intention of disrupting the private sector standards process. At the same time, we believe it is appropriate to consider whether our regulations should be amended to ensure that a single device or group of devices does not occupy all of the spectrum all of the time and thereby deny access to others. Accordingly, we seek comment on whether there is a similar need to adopt rules for digitally modulated transmitters or other devices operating in the 2.4 GHz and 5.8 GHz bands to better facilitate shared use of the spectrum among unlicensed devices.

28. *Transition provisions.* We seek comment on the appropriate transition requirements if the Commission were to adopt a spectrum etiquette for unlicensed devices operating under Sections 15.247 and 15.249. In particular, we seek comment on whether there should be a cutoff date after which new devices must comply with an etiquette requirement. We also seek comment on whether equipment certified before a cutoff date should be permanently grandfathered, or whether there should be a specific cutoff date on the manufacturing, importation, marketing and/or use of equipment that does not comply with any etiquette rules adopted in this proceeding. If so, for which of these actions should there be a cutoff date, and what is the appropriate date?

## V. PROCEDURAL MATTERS

29. *Initial Regulatory Flexibility Analysis.* 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

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<sup>38</sup> See Cellnet letter dated March 28, 2006 at 3.

possible significant economic impact on small entities of the policies and rules proposed in this document. The IRFA is set forth in the Appendix. 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 Notice of Proposed Rule Making as set forth in paragraph 31, and have a separate and distinct heading designating them as responses to the IRFA.

30. *Ex Parte Presentations.* This is a permit-but-disclose notice and comment rule making proceeding. *Ex parte* presentations are permitted, except during the Sunshine Agenda period, provided they are disclosed as provided in the Commission's rules. *See generally* 47 C.F.R. §§ 1.1202, 1.1203, and 1.2306(a).

31. *Filing Comments.* Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. 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.
- For ECFS filers, if multiple docket or rulemaking numbers appear in the caption of this proceeding, filers must transmit one electronic copy of the comments for each docket or rulemaking number referenced in the caption. In completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking 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](mailto: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. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

32. 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, Office of the Secretary, Federal Communications Commission.

- The Commission's contractor will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, NE, Suite 110, Washington, DC 20002. 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 must be addressed to 445 12<sup>th</sup> Street, SW, Washington DC 20554.

33. People with Disabilities: 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](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

34. This document does not contain proposed information collection(s) subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified "information collection burden for small business concerns with fewer than 25 employees," pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4).

## VI. ORDERING CLAUSES

35. Accordingly, IT IS ORDERED that the petition for reconsideration filed by Havens IS HEREBY DISMISSED. This action is taken pursuant to the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), and 303(r).

36. IT IS FURTHER ORDERED that the petition for reconsideration filed by Cellnet Technology IS HEREBY DISMISSED. This action is taken pursuant to the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), and 303(r).

37. IT IS FURTHER ORDERED that the Further Notice of Proposed Rule Making IS HEREBY ADOPTED. This action is taken pursuant to the authority contained in Sections 4(i), 301, 302, 303(e), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), and 303(r).

38. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this notice, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

39. For further information regarding this Memorandum Opinion and Order and Further Notice of Proposed Rule Making, contact Mr. Hugh L. Van Tuyl, Office of Engineering and Technology, (202) 418-7506, e-mail [Hugh.VanTuyl@fcc.gov](mailto:Hugh.VanTuyl@fcc.gov).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

## APPENDIX

### Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),<sup>1</sup> 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 Rule Making (Notice). 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 Notice provided in paragraph 31 of the item. The Commission will send a copy of the Notice, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).<sup>2</sup> In addition, the Notice and IRFA (or summaries thereof) will be published in the Federal Register.<sup>3</sup>

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

This Notice seeks comment on whether the Commission should require unlicensed devices to comply with rules to designed to ensure more efficient sharing of spectrum (*i.e.*, a “spectrum etiquette”) such as the one suggested by Cellnet. Cellnet’s recommended spectrum etiquette would be a trade-off between transmitter power and transmission duration. Devices that operate with a duty cycle of 10% or less would be permitted to operate at the same one Watt power level currently permitted in the rules. As the transmission duty cycle is increased, the maximum permitted power would decrease, down to 0.001 Watts (1 milliwatt) for devices that transmit continuously.

#### B. Legal Basis

The proposed action is authorized under Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307.

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

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.<sup>4</sup> The RFA defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small business concern” under Section 3 of the Small Business Act.<sup>5</sup> Under the Small Business Act, a “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its field of operations; and (3) meets may additional criteria established by the Small Business Administration (SBA).<sup>6</sup>

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<sup>1</sup> 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).

<sup>2</sup> See 5 U.S.C. § 603(a).

<sup>3</sup> See 5 U.S.C. § 603(a).

<sup>4</sup> See 5 U.S.C. § 603(b)(3).

<sup>5</sup> *Id.* § 601(3).

<sup>6</sup> 15 U.S.C. § 632.

*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.”<sup>7</sup> The SBA has developed a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing, which is: all such firms having 750 or fewer employees.<sup>8</sup> According to Census Bureau data for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.<sup>9</sup> Of this total, 1,010 had employment of under 500, and an additional 13 had employment of 500 to 999.<sup>10</sup> Thus, under this size standard, the majority of firms can be considered small.

*Wireless Service Providers.* The SBA has developed a small business size standard for wireless firms within the two broad economic census categories of "Paging"<sup>11</sup> and "Cellular and Other Wireless Telecommunications."<sup>12</sup> Under both categories, the SBA deems a wireless business to be small if it has 1,500 or fewer employees. For the census category of Paging, Census Bureau data for 2002 show that there were 807 firms in this category that operated for the entire year.<sup>13</sup> Of this total, 804 firms had employment of 999 or fewer employees, and three firms had employment of 1,000 employees or more.<sup>14</sup> Thus, under this category and associated small business size standard, the majority of firms can be considered small. For the census category of Cellular and Other Wireless Telecommunications, Census Bureau data for 2002 show that there were 1,397 firms in this category that operated for the entire year.<sup>15</sup> Of this total, 1,378 firms had employment of 999 or fewer employees, and 19 firms had employment of

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<sup>7</sup> U.S. Census Bureau, 2002 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/epcd/naics02/def/NDEF334.HTM#N3342>.

<sup>8</sup> 13 C.F.R. § 121.201, NAICS code 334220.

<sup>9</sup> 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.

<sup>10</sup> *Id.* An additional 18 establishments had employment of 1,000 or more.

<sup>11</sup> 13 C.F.R. § 121.201, NAICS code 517211.

<sup>12</sup> 13 C.F.R. § 121.201, NAICS code 517212.

<sup>13</sup> 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).

<sup>14</sup> *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.”

<sup>15</sup> 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).

1,000 employees or more.<sup>16</sup> Thus, under this second category and size standard, the majority of firms can, again, be considered small.

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

Digitally modulated spread spectrum transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation, and no changes to that requirement are proposed. There would, however, be changes to the compliance requirements.

The applicant for certification would have to demonstrate in the application that the equipment complies with the etiquette requirements. These requirements may include a trade-off between the silent period between transmissions and output power as suggested by Cellnet, or other requirements such as the equipment monitoring spectrum to ensure it is unused before transmitting (listen-before-talk).<sup>17</sup>

Most unlicensed transmitters can be approved by either the Commission's Laboratory or a designated Telecommunication Certification Body (TCB). TCBs are private sector organizations that are permitted to issue equipment certifications in the same manner as the Commission. TCBs would not be permitted to certify equipment subject to the etiquette requirement until the Commission has experience with them and can properly advise TCBs on how to apply the applicable rules.

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

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 the rule, or any part thereof, for small entities.”<sup>18</sup>

If the rules proposed in this notice are adopted, we believe they might have a significant economic impact on a substantial number of small entities. For an entity that chooses to manufacture or import digitally modulated spread spectrum transmitters, the rules would impose costs for compliance with equipment technical requirements, such as modifying or redesigning equipment that does not comply with any new etiquette requirement. However, the burdens for complying with the proposed rules would be the same for both large and small entities. Further, the proposals in this *Notice* are ultimately beneficial for both large and small entities. We cannot find electrical engineering alternatives that would achieve our goals while treating small entities differently. Nonetheless, we solicit comment on any alternatives commenters may wish to suggest for the purpose of facilitating the Commission's intention to minimize the compliance burden on smaller entities.

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

**None.**

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<sup>16</sup> *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.”

<sup>17</sup> See 47 C.F.R. §§ 15.323(c) and 15.407(h) for examples of listen-before-talk requirements currently in the rules.

<sup>18</sup> 5 U.S.C. § 603(c)(1) – (c)(4).