

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

In the Matter of	)	
	)	
Amendment of Part 15 of the	)	
Commission's Rules Regarding	)	ET Docket No. 99-231
Spread Spectrum Devices	)	
	)	

**FIRST REPORT AND ORDER**

**Adopted:** August 22, 2000

**Released:** August 31, 2000

By the Commission: Chairman Kennard issuing a statement; and Commissioners Ness and Furchtgott-Roth issuing a joint statement.

**INTRODUCTION**

1. In this *First Report and Order* ("*First R&O*") we are amending Part 15 of the Commission's rules for frequency hopping spread spectrum devices in the 2.4 GHz band (2400 – 2483.5 MHz).<sup>1</sup> This *First R&O* amends the rules to allow frequency hopping spread spectrum transmitters operating in the band to use a minimum of 15 hopping channels, spanning a total of 75 MHz. The new rules will allow for hopping channels up to 5 MHz wide. The wider bandwidths will permit these systems to provide higher data speeds, thereby enabling the development of new and improved consumer products such as wireless computer local area networks and wireless cable modems.

**BACKGROUND**

2. Spread spectrum devices are currently permitted to operate on an unlicensed basis under Part 15 of the Commission's regulations. Because of the interference avoidance characteristics of spread spectrum technology, these devices are permitted greater output power than non-spread Part 15 transmitters that operate in the same band. Section 15.247 limits the output power of frequency hopping spread spectrum systems in the 2.4 GHz band to 1 Watt. The systems must use a minimum of 75 non-overlapping hopping channels having a 20 dB bandwidth no greater than 1 MHz. In addition, the average time of occupancy on any frequency must not exceed 0.4 seconds in any 30 second period.

---

<sup>1</sup> In the *Notice of Proposed Rule Making* ("*Notice*") in this proceeding, the Commission also proposed to modify the method for measuring processing gain for certain direct sequence spread spectrum systems. See *Notice of Proposed Rule Making*, ET Docket 99-231, 14 FCC Rcd 13046 (1999). Because of the large volume of comments the Commission has received in this proceeding, we have decided to address the topics individually. Accordingly, we are postponing adoption of final rules for measuring processing gain. We will address the issue in a future Report and Order. The action we take here is not dependent on resolution of the processing gain issue.

3. The Commission initiated this proceeding in response to a letter filed by the Home RF Working Group ("Home RF")<sup>2</sup> requesting that Part 15 spread spectrum systems operating in the 2.4 GHz band be permitted to use bandwidths of up to 5 MHz. The *Notice* proposed rule changes consistent with the request of the Home RF Working Group. Specifically, the *Notice* proposed to allow systems to operate with bandwidths of up to 3 MHz or 5 MHz in the 2.4 GHz band. Under the proposal, the systems would utilize 75 hopping channels. Output power would be reduced in proportion to the increase in bandwidth over 1 MHz. For example, systems with 3 MHz bandwidths would operate with output power of no more than 320 mW and channel occupancy time no greater than 0.05 second per hop. Each of the 75 channels would be used at least once during a 3.75 second period. Like existing 1 MHz systems, the average time of occupancy on any channel would not be greater than 0.4 second within a 30 second period. Under the proposal, systems using 5 MHz bandwidths would operate with output power of no more than 200 mW and channel occupancy time of no greater than 0.02 second per hop. Each of the 75 hopping channels would be used at least once during a 1.5 second period. Again, the average occupancy time on any channel would remain 0.4 second or less per 30 second period.

4. A list of parties that filed comments in response to the *Notice* can be found in Appendix A. The commenting parties include manufacturers of both frequency hopping and direct sequence spread spectrum devices, trade organizations representing those manufacturers, members of the general public, school systems and universities, and ISM equipment manufacturers and trade organizations. Comments were submitted both supporting and objecting to the proposal. Some commenters also submitted suggestions for modifications of the proposal contained in the *Notice*.

#### DISCUSSION

5. The Home RF Working Group filed comments supporting the *Notice*. It stated that the proposal will enable frequency hopping spread spectrum devices operating in the 2.4 GHz band to increase data transmission speeds from approximately 2 MB/s to 10 MB/s. It asserts that the proposal will enable the introduction of new wireless devices that will benefit users in education, health care, business, residential, and other environments, as well as persons with disabilities. It states that, most importantly, wide band frequency hopping will enable high-speed wireless communications in the home that will integrate data, voice, and video communications, for such applications as high-speed access to the Internet, wireless cable modems, personal multimedia communicators, headsets for Internet audio broadcasts, and wireless gaming devices. The Home RF Working Group further asserts that the proposed rule changes will not increase interference to existing radio services or to Part 15 devices that operate in the 2400 – 2483 MHz band. The Committee for Unlicensed Broadband Enablement (CUBE),<sup>3</sup> which consists of several members of the Home RF Working Group, submitted a detailed technical analysis and test results claiming to show that interference to Part 15 devices would not increase and in many cases will actually decrease.<sup>4</sup> CUBE states that the proposed rule changes are needed to preserve the competitive balance between the capabilities of frequency hopping and direct sequence spread spectrum devices operating in this band. CUBE asserts that ensuring that frequency hopping technology will be competitive with direct sequence technology will benefit consumers by leading to improved devices at lower costs. CUBE also states that the proposal to permit up to 5 MHz bandwidths will allow

---

<sup>2</sup> See letter from Home RF Working Group dated November 11, 1998.

<sup>3</sup> CUBE consists of Intel, Microlor, Motorola, Proxim and Siemens.

<sup>4</sup> See CUBE reply comments at 26 - 40.

backward compatibility with existing devices. More than 80 additional parties submitted comments and ex parte filings in support of the *Notice*.

6. The Wireless Ethernet Compatibility Alliance ("WECA"), a number of its members, and others filed comments opposing the *Notice*. They argue that the proposed rule change will increase interference to Part 15 devices operating in the 2400–2483 MHz band. They assert that the demand for higher speed data transmission can be met by direct sequence spread spectrum systems or unlicensed national information infrastructure (U-NII) devices, and that there is no need to allow increased bandwidth for frequency hopping spread spectrum devices. Further, WECA asserts that frequency hopping systems using increased bandwidth will be less able to withstand interference from other frequency hopping systems and from direct sequence systems. According to WECA the wide band frequency hopping systems are likely to increase their power output or retransmit signals more often in order to overcome interference, thereby increasing interference to other unlicensed devices operating in this spectrum. WECA and others submitted technical analyses and test results in an attempt to show that the proposed rule changes will increase interference to existing direct sequence and frequency hopping spread spectrum systems. Approximately 40 parties filed comments and ex parte pleadings opposing the *Notice* for similar reasons.

7. **Comments.** Opponents expressed a number of specific concerns. They assert that devices operating under the proposed new rules will not be able to achieve the claimed higher data rates because they will be more prone to multipath and interference problems.<sup>5</sup> The opponents therefore assert the Home RF proposal will have little or no public benefit. The opponents are concerned that, under the *Notice*, wide band frequency hopping systems could use overlapping hopping channels. Intersil and Lucent submitted technical analyses and test data claiming to show that interference from partially overlapping channels is more detrimental to frequency hopping systems than the first-adjacent or co-channel interference.<sup>6</sup> According to Intersil, wide band frequency hopping systems employing overlapping channels will experience a greater level of mutual interference than existing systems that use 1 MHz bandwidths. To compensate, they assert that the systems would likely resort to multiple retransmissions, with the net effect that wide bandwidth systems will transmit continuously and totally occupy the 2400-2483 MHz band to the exclusion of other devices. Silicon Wave supports Intersil's findings.<sup>7</sup> Several parties state that the Home RF proposal will cause interference to devices under development by Bluetooth, a cross-industry group formed to establish industry-wide specifications for unlicensed wireless voice and data communications devices operating in the 2.4 GHz band.<sup>8</sup>

8. WECA and other opponents of the Home RF proposal offer several proposals as a compromise to reduce the potential for interference to other Part 15 devices. They maintain that the output power should be reduced much further than the proposed 200 milliwatts. Several members of WECA<sup>9</sup> offer a compromise that would limit the bandwidth of wide band frequency hopping spread spectrum systems to 4 MHz, establish a minimum of 20 hopping channels, and restrict the output power

---

<sup>5</sup> See, for example, WECA comments dated October 4, 1999 at 9.

<sup>6</sup> See Intersil comments.

<sup>7</sup> See Silicon Wave *ex parte* filing dated December 28, 1999.

<sup>8</sup> See, for example, 3Com, Ericsson, Lucent and Nokia *ex parte* filing dated May 17, 2000.

<sup>9</sup> See WECA letter dated February 15, 2000.

to 65 milliwatts. WECA asserts that this proposal would be consistent with European standard ETS 300 328.<sup>10</sup> The ETS 300 328 standard permits frequency hopping systems in the 2.4 GHz band to use at least 20 non-overlapping hopping channels, each with up to 4 MHz bandwidth, and up to 100 mW effective radiated power, or 61 mW transmitter output power based on an assumed antenna gain of 1.64.<sup>11</sup> WECA notes that, in a previous proceeding where the Commission reduced the number of required hops for spread spectrum devices operating in the 915 MHz band, the output power was reduced in proportion to the square in the number of hopping frequencies.<sup>12</sup> For a system using a 4 MHz bandwidth the number of hopping channels would be reduced by a factor of approximately 4 (from 75 to 20 channels), and the output power would need to be reduced by a factor of 16 (from 1 watt to 60 mW). WECA also suggests two additional requirements. First, WECA proposes to require interference rejection tests for receivers in frequency hopping systems having channel widths greater than 1 MHz. WECA states that the test is necessary to ensure that receiver performance is adequate to minimize the need to retransmit packets, which, in turn, will minimize interference to other devices. Second, WECA suggests that the Commission place a maximum limit of 100 hops/sec for frequency hopping systems using bandwidths greater than 1 MHz. As justification, WECA argues that parties on both sides of the debate have acknowledged that increasing the hopping rate also increases interference.<sup>13</sup> However, WECA concedes that in some cases faster hopping is necessary and desirable for 1 MHz systems. Therefore, WECA does not propose maximum hopping rate restrictions for systems using 1 MHz channels.

9. In response to the opposition, supporters of the *Notice* offer suggestions for accommodating wider bandwidths without overlapping channels. In an *ex parte* filing received March 23, 2000, Proxim Inc. proposes to allow manufacturers to use 3 MHz or 5 MHz wide, non-overlapping hopping channels.<sup>14</sup> The total number of channels used would span at least 75 MHz. Output power for systems using 3 MHz and 5 MHz wide channels would remain 320 mW and 200 mW, respectively, as originally proposed in the *Notice*. Under the Proxim proposal, the average time of occupancy on any hopping channel would be limited to 0.4 seconds within a 30 second period or a period of 30 seconds divided by the 20 dB channel bandwidth, whichever is less.

**10. Decision.** We find that the record supports rule changes that will permit wider bandwidths for frequency hopping spread spectrum systems. We reject the argument that such rule changes will have little or no benefit. We note that numerous parties filed comments indicating that the proposed rule changes would permit the introduction of a wide array of new and improved devices. We have no reason to doubt these claims. We anticipate that any technical constraints to higher data speeds using wider bandwidths can be overcome by appropriate equipment design. We also agree that rule changes

---

<sup>10</sup> See ETS 300 328, "Radio Equipment and Systems (RES); Wideband transmission systems; Technical characteristics and test conditions for data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques" (November 1996). Available at <http://www.etsi.org/>.

<sup>11</sup> The Eastman Kodak Company ("Kodak") also filed comments proposing to align our rules with ETS 300 328. See Kodak comments dated September 8, 1999 and February 15, 2000.

<sup>12</sup> See *Report and Order* in ET Docket 96-8, 12 FCC Rcd. 7488, 62 Fed. Reg. 26239 (1997).

<sup>13</sup> See April 10, 2000 WECA letter at 12.

<sup>14</sup> Prior to submitting the filing, representatives from Proxim, along with Intel, Motorola, Siemens, and Compaq met with Commission staff to express support for a similar modification to the proposed rules.

to permit wide band frequency hopping systems will encourage competition with direct sequence technology, to the benefit of consumers.

11. We have carefully reviewed the technical analyses submitted by both the supporters and opponents of the Home RF proposal. We find that the analyses submitted by the opponents greatly overstate the risk of interference to other Part 15 devices, including existing frequency hopping and direct sequence spread spectrum systems. We note, for example, that Lucent submitted several analyses that conclude that wide band frequency hopping systems would need to reduce their output power by up to 30 dB relative to the existing 1 watt limit in order to produce interference no greater than existing 1 MHz frequency hopping systems. However, the analyses rest upon the assumption that large numbers of wide band frequency hopping devices will be distributed throughout an office or apartment building. We recognize that such situations can occur, however, Lucent has failed to demonstrate that such situations are very likely in practice. For example, given the various alternatives that are available for networking equipment, it seems more reasonable to assume that at least some users will employ direct sequence systems, systems that operate in other frequency bands, or may prefer wired solutions. In any event, even if we were to accept Lucent's assumptions about equipment distribution, it is not reasonable to assume that all such equipment would be attempting to transmit simultaneously.

12. We also note the analyses submitted by WECA, Silicon Wave and others showing that existing frequency hopping receivers use FM discriminators that are less tolerant of co-channel and adjacent channel interference from wide band signals than from existing 1 MHz wide frequency hopping signals. We have no reason to dispute this claim. However, this fact alone does not point to a serious increase in interference. In practice both systems are hopping and only a fraction of the hops would receive interference, which can usually be overcome by automatic retransmission of any lost data packets or error correction technology. Also, as pointed out by CUBE, frequency hopping systems must already deal with wide bandwidth signals from direct sequence systems and it is unclear that wide bandwidth frequency hoppers pose any greater risks. We also note that the current rules already allow hybrid systems where a wide bandwidth direct sequence signal can hop throughout this spectrum. With regard to interference to direct sequence systems, we note that the opponents suggest that the wide band hopping signal would need to be reduced anywhere from 3 to 20 dB, depending upon the hopping rate, to pose no more interference risk than an existing frequency hopping system. However, here again the analyses are based upon unrealistic assumptions about a large distribution of such devices. Further, we note that the results are largely dependent upon whether the interfering device might use a high hopping rate, which is unregulated even for current frequency hopping devices.

13. We find that the opponents' analyses are founded upon a large number of assumptions that lead to a great deal of uncertainty in the conclusions. These include assumptions about receiver performance, signal strengths required for operation, desired operating distance, and separation distances between devices, among others. We observe that, in practice, the characteristics of Part 15 devices vary widely, due in part to the great deal of flexibility permitted under the rules. We note, for example, that manufacturers have chosen to develop products that operate anywhere from 1 milliwatt up to the full 1 watt permitted under the current rules. We also find that the opponents' analyses do not consider several factors that will tend to mitigate interference. For example, most such devices transmit short duration bursts of communication based on packet technology, which reduces the likelihood of simultaneous transmissions. Further, we agree with CUBE that wide band frequency hopping devices will be able to transmit data at faster speeds, thereby reducing the time they are on the airwaves. Even where multiple devices are collocated, there is sufficient spectrum available that the devices should be able to share without causing interference or significant degradation of performance. We observe that most existing devices are already designed to deal with interference sources such as microwave ovens and spread

spectrum systems, and usually include error correction technology and the ability to retransmit signals as necessary to deal with any interference. In most cases, consumers are unaware that interference occurred. We do not believe that wide band frequency hopping devices will significantly alter the performance of devices already in the hands of consumers. Further, these devices employ relatively low power levels and interference would generally occur only between a user's own devices. In such situations the user can often mitigate problems by changing the locations of the devices, reorienting the antennas, or choosing which device to operate at any given time. We believe that further analyses or studies would be counterproductive because it is unlikely to yield any more definitive information and will lead to delay in the availability of new technology that has clear potential benefits for consumers.

14. We note the arguments by the opponents that the Commission has taken actions in the past to avoid increasing potential interference to Part 15 devices, and similarly should not adopt rules here that will increase the risk of interference to these devices. As an initial matter, we want to reinforce here that the Part 15 rules specifically state that such devices have no vested or recognizable right to continued use of any frequency and must accept any interference received from other Part 15 devices. All Part 15 intentional radiators must carry a label informing the user that the device must accept any interference received, including undesired operation. We anticipate that, in most cases, devices operating in the 2450 MHz band will provide performance that is sufficiently reliable to meet consumer needs. Businesses and consumers that cannot tolerate potential interference should consider operation under a licensed radio service. We also note that Part 15 provides a number of alternatives to operation in the 2450 MHz band, such as for spread spectrum operations in the 902 – 928 MHz band and 5725 – 5850 MHz, for unlicensed personal communications service devices, for U-NII devices, and for millimeter wave devices. However, we continue to recognize that it is appropriate to consider the impact of any rule changes on the users of existing Part 15 devices. In this proceeding we have sought to balance the benefits of rule changes to accommodate new types of Part 15 devices against the risk of interference to incumbent devices. We believe that with the rules adopted below, wide band frequency hopping devices can share the 2450 MHz band without significant interference problems.

15. We believe it is appropriate to adopt rules that represent a reasonable engineering compromise between the risks of increased interference and the desire to accommodate new technologies. We are concerned about the comments submitted by the opponents regarding the interference potential of overlapping frequency hopping channels. Intersil's technical analysis presents compelling arguments why overlapping channels should not be allowed. However, as noted above, supporters of the *Notice* have submitted modified proposals which would eliminate the use of overlapping channels. In light of this concession, we will amend our rules to allow frequency hopping systems in the 2.4 GHz band to operate with at least 15 channels. The channels must be separated by at least their 20 dB bandwidths and may never overlap. The total span of channels shall be at least 75 MHz. We will also require that systems have a greater output power reduction than that proposed in the *Notice*. In order to reduce any potential impact on existing unlicensed devices, we will limit transmitter output power to 125 mW for any frequency hopping system that operates with fewer than 75 hopping channels. This power level is consistent with that used by many frequency hopping systems today and is only 3 dB more than opponents of the Home RF proposal. We are concerned that any further power reduction will constrain the useful operating range to such an extent that the devices will not be useful. The provision for 15 non-overlapping channels will accommodate up to 5 MHz bandwidths; which will allow faster data speeds and enable backward compatibility with existing devices.

16. We disagree with arguments that a change in the rules will discourage investments in new products. Conversely, we contend that as technology evolves, we must amend our rules from time to time so that innovation is not discouraged. The Commission has done so in previous rulings. For

example, in 1990, we increased the maximum bandwidth for frequency hopping spread spectrum devices in the 2450 MHz band from 25 kHz to 1 MHz without decreasing the 1 Watt maximum output power.<sup>15</sup> In that same Order, we increased the maximum bandwidth for systems in the 902-928 MHz band from 25 kHz to 500 kHz, again, without reducing output power. We noted that, "[T]he wider bandwidths will provide opportunities for new kinds of equipment to operate under these rules. For example, the wider bandwidths will allow operation of equipment such as wireless local area networks that depend on high speed transmission of data."<sup>16</sup>

17. We also note that the rules were again amended in 1996 to reduce the minimum number of hopping channels in the 902-928 MHz band from 50 to 25.<sup>17</sup> The reduction in the number of hopping channels was accompanied by a reduction in maximum output power from 1 Watt to 250 mW. Generally, the Part 15 spread spectrum rules have continued to evolve in order to reflect changes in technology and consumer needs. We believe the rules we adopt here are responsive to those changes and will continue to encourage the development of new products.

18. In the *Notice*, we proposed minimum hopping rates of 20 hops/s (0.05 s/hop channel dwell time) and 50 hops/s (0.02 s/hop channel dwell time) for systems using 3 MHz and 5 MHz channels, respectively. However, in order to remain consistent with former regulations, we will leave the minimum hopping rate unchanged at 2.5 hops/s. Furthermore, we will not specify a maximum hopping rate for wide band frequency hopping systems, as WECA suggested. We realize that choosing the hopping rate for a system involves trade-offs. For example, CUBE noted that faster hopping may be beneficial in some instances because the result is less time spent, on an instantaneous basis, on a channel that may be experiencing interference.<sup>18</sup> On the other hand, faster hopping may also decrease system efficiency due to the greater amount of non-transmitting transition phases. The Commission has previously given manufacturers latitude in choosing the hopping rate which best suits their particular application. We are confident that manufacturers will continue to use good engineering practices in order to achieve their desired results without increasing the risk of harmful interference.

19. We will not specify receiver standards, as proposed in WECA's April 10, 2000 letter. We find that Section 15.247(a)(1), which requires receiver input bandwidth to match hopping channel bandwidth, provides ample assurance that receivers are indeed functioning as part of a spread spectrum system.<sup>19</sup> That is the intent of the rule section. Additionally, we agree with Proxim that this issue is not appropriate for resolution in this *First R&O* since it was neither proposed by the Commission nor discussed by other parties.<sup>20</sup>

---

<sup>15</sup> See *In the Matter of Amendment of Parts 2 and 15 of the Rules with regard to the operation of spread spectrum systems*, Gen. Docket No. 89-354, 5 FCC Rcd. 4123 (1990), 55 FR 28760 (1990).

<sup>16</sup> *Id.* at paragraph 19.

<sup>17</sup> See *In the Matter of Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters*, ET Docket No. 96-8, 11 FCC Rcd 3068 (1996).

<sup>18</sup> See CUBE reply comments at 30.

<sup>19</sup> 47 C.F.R. §15.247(a)(1).

<sup>20</sup> See letter from Proxim dated April 14, 2000.

20. We believe that this compromise strikes an appropriate balance among the interests of the various parties. It will permit the introduction of wide band frequency hopping technology that will lead to new and innovative devices. At the same time, we have adjusted the proposal to mitigate any adverse impact on other Part 15 devices, including existing frequency hopping and direct sequence spread spectrum systems. We will continue to monitor the situation relative to use of the 2450 MHz band, and, if appropriate, revisit the rules for unlicensed devices operating in this spectrum at a later time.

21. As part of our public interest obligations, we have also considered the impact of our rules, including the interference potential of wide band frequency hopping devices, on small businesses and other end-users of Part 15 products. As discussed above, we believe that the rules we are adopting will enable wide band frequency hopping devices to share the 2450 MHz band with existing Part 15 devices without significant interference problems. Moreover, with regard to the market enhancement aspects discussed above, we believe that the increased product diversification resulting from the rule change will provide greater flexibility in designing wireless networks. Additionally, the availability of a more diverse product base will enable a wider variety of networking solutions, thereby benefiting small businesses and residential consumers who use these products.

22. In *ex parte* presentations to the Commission, some opponents of the Home RF proposal argue that the Commission has previously declined a similar request for modification of its frequency hopping spread spectrum regulations. The opponents refer to a petition for rule making<sup>21</sup> submitted by Symbol Technologies, Inc. (Symbol). In the petition, Symbol requested a reduction in the required minimum number of channels, from 75 to 20, for frequency hopping systems in the 2400 - 2483.5 MHz and 5752 - 5850 MHz bands. Symbol proposed an accompanying reduction in output power equal to (number of hops/75) Watts. For systems using the minimum number of hopping channels output power would have been equal to 266 mW. The Commission exercised its discretion with regard to initiating a rulemaking and denied the petition for a number of reasons.<sup>22</sup> Generally, we stated our concern that the proposal may result in an increase in interference potential to other systems operating in the bands.

23. There are several differences between the Symbol petition and the rules we are adopting here that alter the balancing of competing policies and interests that the Commission must undertake in these instances. For example, the maximum power output we are allowing here for wide band frequency hopping systems is more than 3 dB below the output power proposed by Symbol, 125 mW compared to 266 mW. Additionally, the record in this proceeding contains substantial support for rule changes to permit wider frequency hopping channel bandwidths.<sup>23</sup> In a recent letter to the Commission, Proxim, states that, unlike the Symbol petition, the Commission, "[N]ow has vast amounts of detailed technical analyses and measurements of the interference potential of WBFH . . . ."<sup>24</sup> We agree. The record in this proceeding now provides ample technical information on which to base our decision. Furthermore, the record indicates that the rule change will advance public interest benefits by fostering increased

---

<sup>21</sup> See *In the Matter of Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters*, 11 FCC Rcd 3068 (1996).

<sup>22</sup> *Id.*

<sup>23</sup> *Supra* at paragraph 10.

<sup>24</sup> See letter from Henry Goldberg, Attorney for Proxim, dated July 10, 2000, to Peter A. Tenhula, Senior Legal Advisor, Office of Commissioner Michael K. Powell.



competition for products in the 2450 MHz band and by providing consumers with a wider variety of product from which to choose in order to meet their wireless networking needs. Finally, the original Home RF petition was supported by fifty-three signatories and also was supported by industry working groups, such as the Wireless LAN Interoperability Forum, representing numerous other companies. The Symbol petition did not receive the same widespread backing and support and therefore we dismissed the petition without proposing the rule changes it contained. Accordingly, in view of the sustained interest and the considerable record in this proceeding, we believe that the frequency hopping spread spectrum rules are ripe for revision.

24. In light of the above, we find that the decision not to initiate a rulemaking on the Symbol petition does not require us to reject the rule changes we decide to make at this time based on the record developed in this proceeding. In dismissing the Symbol petition we expressed concern regarding the interference potential to both licensed as well as to other Part 15 devices. The rules we are adopting in this proceeding are sufficiently different such that the technical concerns we expressed regarding the Symbol petition are not decisive here. Furthermore, we find that the demand for wider frequency hopping channels has grown, further justifying the action we take herein. We believe our rules will accommodate this demand without increasing any interference potential to existing devices.

25. Finally, comments filed by parties holding interests in ISM equipment operation expressed concern regarding the Commission's regulatory decisions.<sup>25</sup> International Microwave Power Institute fears that allowing wider bandwidths for Part 15 frequency hopping systems will decrease the systems' ability to reject interference from ISM equipment, resulting in complaints and calls for regulatory protection for Part 15 systems. Fusion Lighting echoes these concerns. Amana urges the Commission not to take any action that may lead to the establishment of emission limits for ISM equipment, such as microwave ovens, operating in the 2400 – 2483 MHz band.<sup>26</sup> As stated above, the most basic principle of Part 15 operation is the requirement to function in a non-interfering manner in the midst of licensed devices. Furthermore, Part 15 transmitters have never been afforded any assurance that their transmissions will be protected from interference received from other devices. In fact, Section 15.5(b) clearly states that their operation is subject to the conditions that no harmful interference is caused and devices must accept any interference received from other devices, including ISM equipment.<sup>27</sup> We emphasize that any frequency hopping spread spectrum system authorized under the new rules will be subject to the conditions of Section 15.5(b). Manufacturers of these devices will be responsible for ensuring that the devices are able to perform properly in the ISM band.

#### PROCEDURAL MATTERS

26. Final Regulatory Flexibility Analysis. The Final Regulatory Flexibility Analysis, required by the Regulatory Flexibility Act, *see* 5 U.S.C. § 604, is contained in Appendix C.

---

<sup>25</sup> *See*, for example, comments of Fusion Lighting, Inc.; International Microwave Power Institute; Amana; and The Association of Home Appliance Manufacturers.

<sup>26</sup> *See* Amana comments.

<sup>27</sup> 47 C.F.R. § 15.5(b)

**ORDERING CLAUSES**

27. Accordingly, IT IS ORDERED that Part 15 of the Commission's Rules IS AMENDED as specified in Appendix B. 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).

28. IT IS FURTHER ORDERED that the Commission's Consumer Information Bureau, Reference Information Center, SHALL SEND a copy of this First Report and Order, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

29. For further information regarding this First Report and Order, contact Neal L. McNeil, Office of Engineering and Technology, (202) 418-2408, TTY (202) 418-2989, e-mail [nmcneil@fcc.gov](mailto:nmcneil@fcc.gov).

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas  
Secretary

## APPENDIX A

## COMMENTS

1. 2 Wire, Inc.
2. 3 Com Corporation
3. Abracon Corporation
4. Aironet Wireless Networks, Inc.
5. Alantro Communications (Bluetooth)
6. Alations Systems Inc.
7. Amana Appliances
8. Apple Computer, Inc.
9. AsiaPac Distribution Pte Ltd.
10. AT&T Corp.
11. BETHELTRONIX, Inc.
12. Bill Branchold
13. BreezeCOM Ltd.
14. Business Engineering Corporation
15. Cal-Chip Electronics
16. Campbell Union High School District
17. Capax Technologies Inc.
18. Casio Manufacturing Corp.
19. Cayman Systems, Inc.
20. CE Windows
21. Cerner Corporation
22. Cisco Systems, Inc.
23. Clarion Corporation of America
24. Clearwire Technologies, Inc.
25. Cognitive
26. Com21, Inc.
27. COMMACCESS TECHNOLOGIES, Inc.
28. Compaq Computer Corporation
29. Copper Mountain Networks, Inc.
30. CSA Automated Pte Ltd
31. Curtis Lee
32. Data Comm for Business, Inc.
33. Data General Corporation
34. Diablo Research Company, L.L.C.
35. Digital Wireless Corporation
36. Disman-Bakner
37. Dogear, LLC
38. Donovan Consulting Group, Inc.
39. DT Research, Inc.
40. Duel Systems, Inc.
41. Electric Cable, Inc.
42. Entre Mobility Concepts
43. Ericsson, Inc.

44. FCI Electronics
45. Filbitron Systems Group Inc.
46. Fuji Personal Systems, Inc.
47. Fusion Lighting, Inc.
48. Gemini Communication AS
49. General Motors Corporation
50. Glenayre Western Multiplex
51. Global Converging Technologies
52. Global Wireless Data
53. Global Wireless Group, Inc.
54. Great American Ventures, LLC
55. Harris Semiconductor
56. Home RF
57. Home Wireless Networks, Inc.
58. HQ Business Centers
59. ICL
60. Imagicast, Inc.
61. Intel Corporation
62. International Microwave Power Institute
63. Intersil
64. James A. Pautler
65. John Zaremba
66. Kinetic Computer Corporation
67. KMJ Communications, Inc.
68. LARIAT
69. Lucent Technologies, Inc.
70. Luna Communication, Inc.
71. McKesson HBOC, Inc.
72. Micrilor
73. Micro Design Services, LLC
74. MJS Network Services
75. MobileStar
76. Motorola, Inc.
77. National Data Communications, Inc.
78. National Semiconductor Corp.
79. NDC Communications, Inc.
80. Network System Technologies
81. Nokia Inc.
82. Nortel Networks Inc.
83. Northeast Data
84. Odyssey Software, Inc.
85. Office of Advocacy, U.S. Small Business Administration
86. Ok Tedi Mining Limited
87. Open Computer Platforms
88. Panja, Inc.
89. PC-Tel, Inc.
90. Polycom, Inc.
91. Prime Performance Technologies
92. Productivity Enhancement Products

93. Proxim, Inc.
94. Radiall
95. RADIOLAN, Inc.
96. Randolph Development L.L.C.
97. Repeater Technologies, Inc.
98. Samsung Electro-Mechanics Co., LTD
99. School PCs
100. SCS Corporation
101. Sharp Electronics Corporation
102. Short Distance Wireless Business Unit of Texas Instruments
103. Siemens Information and Communication Products LLC
104. Silcon Wave, Inc.
105. SILICOMP S.p.a.
106. Smith Investments
107. Solectek Corporation
108. Sonera Corporation
109. Standards Working Group IEEE 802
110. STMicroelectronics, Inc.
111. Symbol Technologies, Inc.
112. TAARCOM, Inc.
113. The Association of Home Appliance Manufacturers
114. The Eastman Kodak Company
115. The Professional Shopper
116. University of Florida, Computer and Information Science & Engineering Dept.
117. University of Oklahoma College of Engineering
118. Wi-LAN, Inc.
119. Wireless Communications Association International, Inc.
120. Wireless Data Corporation
121. Wireless Ethernet Compatibility Alliance
122. Wireless LAN Alliance WLANA
123. Wireless LAN Interoperability Forum

#### REPLY COMMENTS

1. 3Com Corporation
2. Agilent Technologies
3. Bluetooth Promoters, et al.
4. Committee for Unlicensed Broadband Enablement
5. Ericsson
6. Home Wireless Networks, Inc.
7. Institute of Electrical and Electronic Engineers 802
8. Intersil Corporation
9. Lucent Technologies, Inc.
10. Microsoft Corporation
11. Motorola, Inc.
12. Proxim, Inc./Microlor, Inc.
13. Wireless Ethernet Compatibility Alliance

## APPENDIX B

A. Title 47 of the Code of Federal Regulations, Part 15 is amended as follows:

Section 15.247 is amended by adding a new paragraph (a)(1)(iii) and revising paragraph (b)(1) to read as follows:

**Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.**

(a) \* \* \*

(1) \* \* \*

(i) \* \* \*

(ii) \* \* \*

(iii) Frequency hopping systems in the 2400 - 2483.5 MHz band may utilize hopping channels whose 20 dB bandwidth is greater than 1 MHz provided the systems use at least 15 non-overlapping channels. The total span of hopping channels shall be at least 75 MHz. The time of occupancy on any one channel shall be no greater than 0.4 seconds within the time period required to hop through all channels.

(2) \* \* \*

(b) \* \* \*

(1) For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels, all frequency hopping systems in the 5725-5850 MHz band, and all direct sequence systems: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

## APPENDIX C

## FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act ("RFA"),<sup>28</sup> an Initial Regulatory Flexibility Analysis ("IRFA") was incorporated in the *Notice of Proposed Rule Making* ("NPRM") in this docket, ET Docket 99-231.<sup>29</sup> The Commission sought written public comment on the proposals in the NPRM, including comment on the IRFA. As described more fully below, we find that the rules we adopt in the *First Report and Order* will not have a significant economic impact on a substantial number of small entities.<sup>30</sup> We have nonetheless provided this Final Regulatory Flexibility Analysis ("FRFA") to provide a fuller record in this proceeding. This IRFA conforms to the RFA.<sup>31</sup>

**A. Need for and Objective of the Rules.**

The rules adopted in this First Report and Order are intended to facilitate the development of spread spectrum technology, particularly for high data-rate wireless applications. The rules will permit frequency hopping spread spectrum systems in the 2.4 GHz band (2400-2483.5 MHz) to operate with wider hopping channels. This action is taken in response to a request filed by the Home RF Working Group ("Home RF"). The Home RF request stated that the increased bandwidth is needed to meet business and consumer demand for high-speed data applications.

In the NPRM in this proceeding, the Commission also proposed to modify the method for measuring processing gain for certain direct sequence spread spectrum systems. Because of the large volume of comments the Commission has received in this proceeding, we have decided to address this second issue separately. Accordingly, we are postponing adoption of final rules for measuring processing gain, and will address the issue in a future Report and Order. The action we take here is not dependent on resolution of the processing gain issue.

**B. Summary of Significant Issues Raised by Comments in Response to the IRFA.**

We received six comments in response to the IRFA in this proceeding. Three were submitted by the Office of Advocacy of the U.S. Small Business Administration (SBA), one by Proxim, Inc. (Proxim), which is a small business, and one comment apiece by the U.S. Senate and House Small Business Committees.

In its comment dated October 4, 1999, SBA stated that the IRFA did not comply with the RFA. Specifically, SBA stated that the IRFA did not fully consider the impact that the Commission's proposal would have on small entities. Furthermore, SBA stated that the IRFA failed to estimate the number of

---

<sup>28</sup> See 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §601 *et. seq.*, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

<sup>29</sup> See ET Docket 99-231, FCC 99-149, 64 Fed. Reg. 38877 (1999).

<sup>30</sup> Thus, we could certify that an analysis is not required. *See* 5 U.S.C. § 605(b).

<sup>31</sup> *See* 5 U.S.C. § 604.

small businesses affected, describe the objectives of the proposed rules, propose alternatives, and properly state the paperwork burden the rules would place on equipment manufacturers. Accordingly, SBA stated that the Commission should not adopt final rules in this proceeding until the Commission conducted a fuller, superseding IRFA.

Subsequently, in the first of the remaining five, *ex parte* comments filed in response to the IRFA, Proxim filed a comment dated January 11, 2000. Proxim stated that approximately 80 small businesses filed comments in this proceeding, constituting over 66 percent of the almost 120 comments filed in total. Proxim noted that small business participated during both the comment and reply comment periods, and filed comments on both sides of the proposals. Last, Proxim argued that the proposal to permit frequency hopping spread spectrum systems would benefit small business by permitting "a low cost means for home-based business to create a low-cost network capable of supporting high-capacity communications" – a network capability that, currently, "likely is beyond the financial and/or technical reach of many small businesses and most very small home-based businesses."

SBA's second comment was dated February 29, 2000. SBA clarified its position in light of Proxim's filing, stating that even if the significant economic effect of a proposal will be beneficial for small business, the proposal must be described and analyzed in an adequate IRFA. SBA stated that it did not wish to delay the issuance of final rules, and that, in light of the information provided by Proxim, the Commission should rectify its IRFA by conducting an adequate FRFA in conjunction with the adoption of final rules.

The Senate Committee on Small Business, in its comment dated August 8, 2000, stated that the IRFA did not sufficiently describe why the proposed action was being taken, did not discuss the reporting or recordkeeping requirements or skills necessary to satisfy the requirements of the rules, and did not offer alternatives to the proposed rules that would minimize the impact on small business. The Committee asked that the Commission revise the IRFA. The House Committee on Small Business, in its comment dated August 15, 2000, concurred with the Senate Committee's position.

SBA, in its third comment, dated August 18, 2000, stated that, in filing its second comment, SBA "did not intend to withdraw its critical comments or relieve the FCC of its duty under RFA."

In response to these comments, we have conducted this present, full FRFA. We also take this opportunity to discuss the previous analysis or IRFA, which was sufficient to generate comments from the small business community. We believe that the record indicates that the IRFA met the objectives of the RFA. Delaying issuance of final rules at this time would not, therefore, advance those objectives.

First, concerning whether the IRFA sufficiently described why the proposed action was being taken, we note that the reason for action is clearly stated in the first paragraph of the Notice. The paragraph reads in part, "We take this action to facilitate the continued development and deployment of spread spectrum technology, particularly for high data rate wireless applications." Therefore, interested parties who read the document were notified in the beginning of the item why the action was being taken. While the IRFA did not specifically mention the purpose of the proposed action, we believe that the Notice adequately informed interested parties of the reason for the proposed action, as required by the Regulatory Flexibility Act.

Concerning whether the IRFA adequately discussed the reporting or recordkeeping requirements or skills necessary to satisfy the rule requirements, we note that the IRFA stated that the proposed rule changes would not alter any current reporting or recordkeeping requirements. We emphasize that Part 15



transmitters must be authorized under the Commission's certification procedure prior to marketing. The certification procedure requires that the device in question be tested to ensure that it is in compliance with Commission regulations. An application for certification must contain a report describing the test procedure as well as the test results. The proposal in the NPRM would permit alternative modes of operation for frequency hopping systems. However, the new operating modes would not alter the reporting or recordkeeping requirements for manufacturers of these devices.

The NPRM also proposed a modified test procedure for certain direct sequence spread spectrum systems. The Notice proposed that, "manufacturers of direct sequence spread spectrum systems that use a spreading rate less than 10 chips per symbol to submit the results of the jamming margin test as well as a calculation of processing gain to verify compliance." This statement may have created the impression that the Commission was intending to impose new reporting requirements. However, as stated above, the certification procedure already requires the submission of test results and a report showing compliance with the rules. Our proposal only sought to clarify the specific information to include in this report.

Concerning whether the IRFA should have offered and discussed alternatives to the proposed rules that would have minimized the impact on small businesses, we believed that the proposed rules would have had a positive affect on small businesses. Thus, we did not offer alternatives. Again, we should emphasize that the proposals would not require manufacturers to modify existing products. Instead, the rules would allow the introduction of new devices into the marketplace. We expect that the final rules we have adopted will benefit small manufacturers by allowing them to distribute more diverse products.

Concerning whether the IRFA provided sufficient information so that the public could react in an informed manner, we note that, pursuant to the Administrative Procedure Act, *see* 5 U.S.C. § 553, the Commission must provide ample opportunity for the public to comment on proposed rules. In this proceeding, the Commission provided a 75-day filing window for initial comments, followed by a 122-day period for reply comments. In total, the public had over six months to provide comments. More than 200 comments and other submissions were filed in this proceeding. Many of the commenters, including small businesses and educational institutions, enthusiastically endorsed the proposed changes. With the exception of the Small Business Administration, which subsequently clarified its comments, and Congress, no commenters raised adverse concerns regarding the IRFA. The Commission relies upon the public record to develop its rules. The rules changes in this proceeding were initiated at the urging and support of the small business community.

In addition, for existing manufacturers of frequency hopping equipment to take advantage of the revised rule and begin to supply the new frequency hopping equipment, the manufacturer will need only to slightly modify frequency control components in their products. Such modification appears to us, given common understanding of the equipment, to be achievable with minimal effort and cost. In fact, as stated previously, many manufacturers, including small businesses, enthusiastically supported this rule change.<sup>32</sup>

Last, we note that, in light of comments in response to the NPRM, we have altered our equipment usage parameters to eliminate the interference potential that might have resulted under the proposed rule. The

---

<sup>32</sup> Also, as discussed *supra*, at paragraphs 10, 12, and 20, we have considered the competitive, interference, and other issues with regard to direct sequence and frequency hopping devices.

changes have included eliminating the use of overlapping channels and reducing the maximum permitted power output

### C. Description and Estimate of the Number of Small Entities to Which the 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>33</sup> The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdictions." In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act, 15 U.S.C. § 632, unless the Commission has developed one or more definitions that are appropriate to its activities.<sup>34</sup> A "small business concern" is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) meets any additional criteria established by the Small Business Administration ("SBA").<sup>35</sup>

The Commission has not developed a definition of small entities specifically directed toward manufacturers of unlicensed communications devices. Therefore, we will utilize the SBA definition applicable to manufacturers of Radio and Television Broadcasting and Communications Equipment. According to the SBA regulations, unlicensed transmitter manufacturers must have 750 or fewer employees in order to qualify as a small business concern.<sup>36</sup> Census Bureau data indicates that there are 858 U.S. companies that manufacture radio and television broadcasting and communications equipment, and that 778 of these firms have fewer than 750 employees and would be classified as small entities.<sup>37</sup> This action will not have a negative impact on small entities that manufacture unlicensed spread spectrum devices.

According to SBA regulations, an electronic computer manufacturer must have 1,000 or fewer employees in order to qualify as a small entity.<sup>38</sup> Census Bureau data indicates that there are 716 firms that manufacture electronic computers. Of those, 659 have fewer than 500 employees and qualify as small entities.<sup>39</sup> The remaining 57 firms have 500 or more employees; however, we unable to determine how many of those have 1,000 or fewer employees and therefore also qualify as small entities under the SBA definition.

---

<sup>33</sup> 5 U.S.C. § 603(b)(3).

<sup>34</sup> See 5 U.S.C. § 601(3).

<sup>35</sup> 15 U.S.C. § 632.

<sup>36</sup> See 13 C.F.R. § 121.201, (SIC) Code 3663.

<sup>37</sup> See U.S. Dept. of Commerce, *1992 Census of Transportation, Communications and Utilities* (issued May 1995), SIC category 3663.

<sup>38</sup> 13 C.F.R. 121.201, SIC code 3571.

<sup>39</sup> U.S. Small Business Administration 1995 Economic Census Industry and Enterprise Report, Table 3, SIC Code 3571. (Bureau of the Census data adapted by the Office of Advocacy of the U.S. Small Business Administration).

According to SBA regulations, a computer terminal manufacturer must have 1,000 or fewer employees in order to qualify as a small entity.<sup>40</sup> Census Bureau data indicates that there are 757 firms that manufacture computer terminals. Of those, 162 have fewer than 500 employees and qualify as small entities.<sup>41</sup> The remaining 11 firms have 500 or more employees; however, we unable to determine how many of those have 1,000 or fewer employees and therefore also qualify as small entities under the SBA definition.

According to SBA regulations, a computer peripheral equipment manufacturer must have 1,000 or fewer employees in order to qualify as a small entity.<sup>42</sup> Census Bureau data indicates that there are 757 firms that manufacture computer terminal equipment. Of those, 701 have fewer than 500 employees and qualify as small entities.<sup>43</sup> The remaining 56 firms have 500 or more employees; however, we unable to determine how many of those have 1,000 or fewer employees and therefore also qualify as small entities under the SBA definition.

According to SBA regulations, a manufacturer of household appliances must have 500 or fewer employees in order to qualify as a small entity.<sup>44</sup> Census bureau indicates that there are 55 firms that manufacture household equipment in the "catch all" category for such data. Of those, 42 have fewer than 500 employees and qualify as small entities.<sup>45</sup> The remaining 13 firms have 500 or more employees, and therefore, unless one or more has exactly 500 employees do not qualify as small entities under the SBA definition.

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

Part 15 transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. See 47 C.F.R. §§ 15.101, 15.201, 15.305, and 15.405. The new regulations will add permissible methods of operation for frequency hopping spread spectrum systems. No new reporting or recordkeeping requirements will be required for the manufacturers of frequency hopping spread spectrum devices.

As previously noted, in the NPRM in this proceeding, the Commission also proposed a modified test procedure for certain direct sequence spread spectrum devices. Although this *First Report and Order* does not address this second issue, we emphasize that the proposed processing gain measurement procedure would not alter reporting or recordkeeping requirements. As stated above, the certification procedure already requires the submission of test results and a report showing compliance with

---

<sup>40</sup> 13 C.F.R. 121.201, SIC code 3575.

<sup>41</sup> U.S. Small Business Administration 1995 Economic Census Industry and Enterprise Report, Table 3, SIC Code 3575. (Bureau of the Census data adapted by the Office of Advocacy of the U.S. Small Business Administration).

<sup>42</sup> 13 C.F.R. 121.201, SIC code 3577.

<sup>43</sup> U.S. Small Business Administration 1995 Economic Census Industry and Enterprise Report, Table 3, SIC Code 3577. (Bureau of the Census data adapted by the Office of Advocacy of the U.S. Small Business Administration).

<sup>44</sup> 13 C.F.R. 121.201, SIC code 3639 (Household Appliances, Not Elsewhere Classified).

<sup>45</sup> U.S. Small Business Administration 1995 Economic Census Industry and Enterprise Report, Table 3, SIC 3639 (Bureau of the Census data adapted by the Office of Advocacy of the U.S. Small Business Administration)>

Commission rules. The proposal would clarify the specific information to include in this report.

**E. Steps Taken To Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered.**

The rule changes adopted in this *First Report and Order* are intended to support the development of improved frequency hopping spread spectrum systems. These actions will benefit frequency hopping spread spectrum manufacturers, including small entities.

In the NPRM, we proposed to allow frequency hopping systems in the 2400-2483.5 MHz band to operate with bandwidths of up to 5MHz. The increase in bandwidth over 1 MHz would be accompanied by a proportionate decrease in output power. The minimum number of hopping channels would remain the same.

Supporters of the NPRM argued that the rule changes were needed to accommodate high-speed data transmissions for home and business applications. The opponents argued that the proposed changes would cause unacceptable interference to other Part 15 devices already operating in this spectrum. While they recognized that Part 15 devices have no interference protection under the rules, opponents asserted that the Commission should act on public interest grounds to avoid increasing interference to existing consumer devices. They suggested several modifications to the proposal which, they claimed, would reduce the interference threat. Proponents of the NPRM also filed modified proposals in an effort to reach a compromise.

In response to the comments filed by interested parties, including small businesses, the Commission modified the proposal contained in the NPRM by requiring frequency hopping systems to use at least 15 non-overlapping channels. We have also reduced the maximum transmitter output power from that which was proposed in the NPRM. The new rules will accomplish the objectives stated in the NPRM while creating less of an interference threat to other systems currently operating in the 2400 – 2483.5 MHz band. The changes we adopt in this *First Report and Order* will result in increased maximum data rates for frequency hopping spread spectrum devices operating in the 2.4 GHz band. The rules will benefit manufacturers of home electronic equipment, including small businesses, by enabling them to offer customers a greater variety of products that meet their customers' networking needs.

As noted, we received numerous comments in this proceeding, and one alternative would have been to deny the request of Home RF and other proponents. That alternative, which we rejected, would not have resulted in the introduction of high-speed data applications that we believe will result as a consequence of the rules we are adopting.

**Report to Congress.** The Commission will send a copy of the First Report and Order, including this FRFA, in a report to Congress pursuant to SBREFA.<sup>46</sup> In addition, the Commission will send a copy of the First Report and Order, including the FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the First Report and Order and FRFA (or summaries thereof) will also be published in the Federal Register.<sup>47</sup>

---

<sup>46</sup> See 5 U.S.C. § 801(a)(1)(A).

<sup>47</sup> See 5 U.S.C. § 604(b).

**SEPARATE STATEMENT OF  
CHAIRMAN WILLIAM E. KENNARD**

Re: Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices,  
(ET Docket No. 99-231)

The Commission action to allow frequency hopping spread spectrum systems in the 2.4 GHz band to use wider hopping channels will facilitate development of new high-speed data devices for business and consumer applications such as transmission of CD-quality audio and video streams from home PCs to portable devices. The wider bandwidths will permit these systems to provide higher data speeds, thereby enabling the development of new and improved consumer products such as wireless computer local area networks and wireless cable modems.

The Commission's action represents a reasonable engineering compromise between the risks of increased interference and the desire to accommodate new technologies. We believe that this compromise strikes an appropriate balance among the interests of the various parties. It will permit the introduction of wide band frequency hopping technology that will lead to new and innovative devices. At the same time, we have adjusted the proposal to mitigate any adverse impact on other Part 15 devices.

The changes that we have adopted represent an important step in responding to technology evolution and will foster small business development and further innovation. The rules changes will benefit small manufacturers by allowing them to distribute more diverse products. In turn, the more diverse product selection will provide greater flexibility in designing wireless networks, thereby benefiting small businesses that use these types of devices.

**JOINT STATEMENT OF  
COMMISSIONERS SUSAN NESS AND HAROLD FURCHTGOTT-ROTH**

Re: Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices,  
(ET Docket No. 99-231).

By this Order, the Commission amends Part 15 of its rules in a manner that will permit frequency hopping spread spectrum devices in the 2.4 GHz band to provide higher data speeds. These amendments should pave the way for manufacturers of these devices to bring new services to consumers and compete in the marketplace for distribution of wireless computer local area networks and cable modems. We are concerned about the effect these changes will have on spread spectrum devices already in the hands of consumers. However, we recognize that the FCC engineering staff has worked hard for more than a year to assess the interference claims of the parties and adjust the proposed amendments in an attempt to balance the benefits of the new spread spectrum devices against the potential for interference to existing devices. Unlicensed operations under Part 15 are, and should continue to be, a valuable laboratory for experimentation and the provision of innovative services to American consumers in this band.

We also write separately because the Commission's initial regulatory flexibility analysis ("IRFA") in this proceeding was unquestionably terse. The Small Business Administration and the Committees on Small Business of both the Senate and House of Representatives have expressed their concern over the lack of specificity in our initial statement. The Regulatory Flexibility Act, including Section 603, requires the FCC to assess and explore the impact of our regulations on small businesses. The IRFA itself is designed not only to cause the Commission to examine these issues thoughtfully, but also to allow outside parties to comment fully on these issues. In this regard, we note more than 100 interested parties including small businesses commented in this proceeding and that there has been substantial public interest in the docket. Nonetheless, small businesses represent a creative and booming sector of our economy and we have an obligation to ensure that their regulatory burden is no heavier than necessary to achieve the goals of the Act. Thus, going forward, we believe the Commission should recommit itself to a close examination of the issues raised by the Regulatory Flexibility Act. We have a statutory obligation to do so and the small business community deserves nothing less.