

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

<i>In the Matter of</i>)	
)	
Amendment of Part 15 of the Commission's Rules)	
Regarding Spread Spectrum Devices)	ET Docket No. 99-231
)	
Wi-LAN, Inc.)	DA 00-2317
Application for Certification of an Intentional)	
Radiator Under Part 15 of The Commission's)	
Rules)	

REPLY COMMENTS OF APPLE COMPUTER, INC.

Upon reviewing the initial comments in this proceeding, Apple Computer, Inc. (Apple) is more convinced than ever that the Commission has proposed well-reasoned rule changes essential for the continued evolution of Part 15 technology and markets. The Commission's initiatives are timely for the continued "tremendous success" of the spread spectrum industry, as well as for putting into place new "digital rules" that are a natural outgrowth of the current rules. Apple believes that with the minor modifications, the Commission can ensure that the intent of its Further Notice of Proposed Rulemaking is realized.

Apple Supports The Commission's Proposals

As noted in its initial comments, Apple supports the goals of the Commission's proposals. It also believes that several refinements to those proposals would facilitate coexistence among direct sequence spread spectrum systems ("DSSS"), such as based on 802.11 devices, frequency hopping spread spectrum systems ("FHSS"), such as Bluetooth, and the new digital technology systems ("DTS") that the Commission proposes to permit.

Specifically, Apple supports the Commission's proposal to permit FHSS systems with as few as 15 hopping channels, provided that the device's output power does not exceed 125 mW

and adaptive hopping is used. Apple also believes that the Commission should permit fewer than 15 hopping channels with a corresponding reduction in output power.¹

But while the Commission should encourage intelligent adaptive hopping, it should not mandate it. First, it is not necessary. Manufacturers are likely to find that it is beneficial to operate 802.11b-based devices and FHSS devices (such as a Bluetooth products) in the same environment.² Thus, FHSS developers are likely to have a strong incentive to use adaptive hopping – whether required by rule or not. In addition, studies of adaptive hopping algorithms are ongoing. This is surely not the time to lock in a rule that might limit adaptive hopping to a particular technique.³ Finally, there is always a cost imposed when any particular technology solution is imposed by regulation. Such technology mandates should be avoided where possible. They can be avoided here.

Apple continues to believe that adaptive hopping is critical to the coexistence of Part 15 technologies. Thus, it also believes that Section 15.247(h) should be clarified to permit a *range* of intelligent hopping techniques within a system or network so that the most efficient use of available frequencies could be made.⁴

With regard to the Commission’s DTS proposals, Apple urges the Commission to adopt appropriate power spectral density limits to ensure that high-power, narrow band interferers

¹ Apple proposed that the Commission permit between one and fifteen hopping channels with a corresponding linear reduction in output power from 125 mW to the output power that would correspond to the level necessary to meet the Section 15.249 field strength limit. Apple comments at footnote 4.

² Apple comments at page 4 and footnote 8.

³ Apple comments at 5.

⁴ In its comments Apple requested that the Commission clarify that device designers have the flexibility to use different methods to implement intelligent hopping. Apple noted that a device that “sniffs” RF spectrum over the air to determine occupancy is one way to accomplish “adaptive” hopping. But also it noted that other, higher-level, intelligent hopping techniques exist. For example, there could be an unlicensed network that intelligently hops its own frequencies to minimize its random access of frequencies available to all band users. The intelligence required by the network’s transmitters could be sent over a wired network shared by systems, or where the systems reside on a common platform, by more direct means. This may reduce the need to use over-the-air frequencies to provide hopping intelligence to devices that are part of a system – an obvious benefit.

cannot be introduced into the 2.4 GHz band. To that end, Apple believes that the Commission should simply cap the power spectral density limit for DTS devices.⁵

Apple thinks that the Commission's alternative proposal to amend the U-NII rules to include the 915 MHz and 2.4 GHz bands should be deferred. But it supports the Commission's proposal to extend the upper limit of the U-NII band.⁶

In addition, Apple urges that the processing gain requirement be eliminated as unnecessary for the reasons the Commission states. Finally, Apple requests that during the pendency of this proceeding, the Commission entertain waivers to permit the authorization of FHSS devices that meet the requirements of the rules proposed in the FNPRM.⁷

The Commission Should Reject Proxim's Counter-Proposals.

A large industry consensus responded favorably to the Commission's FNPRM. Inevitably, however, there were a few parties seeking to undermine the Commission's efforts with proposals contrary to the intent of the FNPRM. In particular, the arguments of Proxim, Inc., if accepted, would do enormous damage to the growth of a wide-range of Part 15 technologies and services.

Simply put, Proxim seeks to maintain the current Section 15.247 rules that the Commission rightfully seeks to relax. Specifically, Proxim argues that the Commission's FHSS proposals could lead to increased interference by permitting systems that spread their signals less than is now required.⁸ In addition, Proxim disagrees with the general view of narrow band FHSS developers that the Commission's current rules effectively bar the use of intelligent frequency

⁵ In its comments, Apple noted that the ETSI limits, which have spawned unlicensed devices that continue to operate successfully, may be appropriate and certainly are less burdensome on manufacturers.

⁶ Apple comments at 7-8.

⁷ Apple comments at 11.

⁸ Proxim comments at 3.

hopping techniques. Further, Proxim claims that the selection of 15 non-overlapping channels spanning 75 MHz is arbitrary and offers as an alternative a requirement that FHSS systems occupy at least 60 percent of the 2400-2483.5 MHz band.⁹ Proxim also argues that the Commission's current proposals would undercut the rule changes it recently adopted in the First Report and Order in this proceeding.¹⁰ Finally, despite its fear that the Commission's proposals will ruin the 2.4 GHz operating environment, Proxim proposes that DTS devices be permitted to operate at "maximum total power" of 1 watt – without a reduction of the current power spectral density limit.¹¹

Proxim's arguments should be flatly rejected. Although it claims to support the Commission's approach to allow more flexible use of the 2.4 GHz band, its counterproposals would accomplish the opposite.

Less Signal Spreading Will Not Increase the Potential For Interference.

Proxim claims that the Commission's FHSS proposal will result in narrow band interferers. This is simply not true. The Commission's proposal permits reduced hop sets and eliminates the bandwidth span requirement only with a corresponding reduction in output power. The key to limiting the potential for interference is the reduced output power. In fact, as Apple stated in its comments, the limiting case would be a "one hop" device that could be approved now under Section 15.249 rules.

Proxim's remedy to this non-existent problem is to put into place a bandwidth occupancy requirement of 60 percent. This is no more than a repackaging of the current 75 MHz bandwidth span requirement with a slight relaxation to require that 50 MHz of bandwidth be used. The

⁹ *Ibid.*

¹⁰ Proxim comments at 4.

¹¹ Proxim comments at 5.

better answer is both simple and available. If output power is reduced with the number of hopping channels used, interference potential is controlled.¹²

The Proposed Changes Will Not Undercut the First Report and Order.

Proxim claims that the proposed Section 15.247(a)(1)(iii) rule change “could” be interpreted as undercutting the rule changes adopted in the First Report and Order (“First R&O”).¹³ Proxim’s cure for this alleged problem is to maintain the current Section 15.247(a)(1)(iii) language. However, the Commission’s proposed modification of Section 15.247(1)(a)(iii) does not undermine the actions taken in the First R&O. The First R&O simply put into place rules that permitted wide band frequency hopping systems.¹⁴ Specifically, those rules permit systems with channel bandwidths up to 5 MHz with as few as 15 hopping channels. The Commission’s proposed rule would still permit 5 MHz channel bandwidths with as few as 15 channel hop sets. The only new requirement is that any system using less than 75 non-overlapping channels must now attempt to avoid occupied channels by modifying its hop sets in accordance with Section 15.247(g).

Perhaps Proxim’s concern is with the language of Section 15.247(g), which the Commission does not propose to change.¹⁵ That section states that designers of systems that choose to use adaptive hopping can do so in a manner that avoids transmitting on an already occupied channel. Apple can only speculate that Proxim must believe that the language of

¹² In this regard, Ademco proposes that systems employing 15 hopping channels be required to deploy frequencies uniformly over 90 percent, or about 75 MHz, of the 2400-2483.5 MHz band. Ademco comments at .

¹³ Proxim is referring to Section 15.247(a)(1)(iii), which currently states, “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 average time of occupancy on any one channel shall not be greater than 0.4 seconds within the time period required to hop through all channels.”

¹⁴ First Report and Order at ¶ 10.

¹⁵ Section 15.247(g) of the FNPRM is unchanged from Section 15.247(h) of the Commission’s rules. Because of other proposed changes in the FNPRM, it has simply been relabeled.

Section 15.247(g) strictly forbids ever landing on an occupied channel. Both the Commission and the industry surely realize that this would not be possible. Therefore, if there is a rule problem that precludes the use of a 15 channel, 5 MHz system with adaptive hopping, it is the unchanged Section 15.247(g), not the proposed Section 15.247(1)(a)(iii).¹⁶ In any event, Apple finds Proxim’s concern with the adaptive hopping requirement curious as Proxim itself cites the HomeRF wireless LAN “standard” as an example of a frequency hopping technology that uses effective adaptive frequency hopping.¹⁷

DTS Devices Should Operate at Reduced Power Spectral Densities.

Proxim states that DTS devices should be permitted to operate at a maximum total output power of 1 watt – presumably because they might be useful in outdoor environments. As an initial matter, outdoor use is not unique to DTS devices. What will be unique to DTS devices is that they will not be required to spread their signals. Consequently, as Apple pointed out in its comments, a 1 watt DTS transmitter could occupy as little as 500 kHz of bandwidth and thus appear as a narrow band interferer to 802.11b networks.¹⁸ This problem would be completely avoided if the Commission makes a slight revision to its DTS proposal by adopting a lower power spectral density limit for such devices. Apple offered for consideration the ETSI limit of 10 dBm/MHz and continues to believe this value has merit.¹⁹ In any event, if the Commission adopts a 1-watt output power for DTS device, it must reduce the power spectral density from the current 8dBm/3 kHz limit.

¹⁶ Alternatively, rather than maintain the current Section 15.247(1)(a)(iii) and add a new section for narrow band adaptive hopping systems as Proxim suggests, the Commission could slightly revise its proposal to specifically exclude a HomeRF-type, 5 MHz channel system from any adaptive hopping requirement.

¹⁷ Proxim comments at 3. An overview of the HomeRF technology can be found at the HomeRF web site. See, http://www.homerf.org/data/events/past/pubseminar_0501/tech_overview.pdf.

¹⁸ Apple comments at 9.

¹⁹ *Ibid.* Apple notes that Agere systems (“Agere”) proposes this limit. Agere comments at ¶ 23.

The Professed Concerns About the Noise Floor are Misplaced.

Two commenters have raised concerns about the “noise floor” and, therefore, suggested that the Commission’s proposals be rejected or – unbelievably – that the Commission impose *new* restrictions on Part 15.

The American Radio Relay League (“ARRL”) and Sirius Satellite Radio (“Sirius”) say that a “proliferation” of Part 15 devices will increase the noise floor in the 2400-2483.5 MHz band.²⁰ ARRL suggests that the Commission not relax its rules “merely” for the sake of deregulation. Sirius actually proposes new Part 15 field strength limits.²¹

It is worth remembering that a “proliferation” of Part 15 devices means that consumers are using new advanced wireless devices to receive new advanced wireless services. In short, a “proliferation” of such devices is in the public interest and just what the Commission should hope for.

Moreover, the noise floor concerns are misplaced. The fact is that 2.4 GHz Part 15 devices generally operate with short ranges and have symmetrical transmission parameters. Because many devices are battery powered, high output powers are not used. And because of the aforementioned symmetrical operation, high base station output powers are not used. Consequently, the Commission’s proposal will not cause any material increase of the aggregate noise floor in the 2400-2483.5 MHz band. And while Sirius has come to believe that the protection of its investment justifies wiping out other users of the spectrum anywhere near its band, its proposed field strength limits are wholly unnecessary and even more unjustified. They also are not within the scope of the FNPRM and must be rejected for that reason alone.

²⁰ ARRL comments at ¶ 2; Sirius comments at 4.

²¹ Sirius proposes a limit of 14.6 dBuV/m measured at 3 meters for a single device and 18.6 dBuV/m measured at 3 meters for multiple devices.

Conclusion

The Commission's forward-looking proposals for amending its rules struck almost exactly the right balance. They should be adopted with minor revisions as proposed by Apple in its comments. If adopted, the Commission's proposal will promote greater use of the 2400-2483.5 MHz band and will greatly increase coexistence of competing technologies.

Respectfully submitted,

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