

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

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FEDERAL COMMUNICATIONS COMMISSION
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In the Matter of)
)
Amendment of Part 15 of the)
Commission's Rules Regarding)
Spread Spectrum Devices)

Wi-LAN, Inc)
Application for Certification of an)
Intentional Radiator Under Part 15)
of The Commission's Rules)

ET Docket No. 99-231

DA 00-2317

COMMENTS OF PROXIM, INC.

Proxim, Inc. ("Proxim"), by counsel and pursuant to Sections 1.415 and 1.419 of the Commission's rules,¹ hereby submits Comments in the above-referenced proceeding. In this proceeding, the Commission proposes to revise Part 15 of its rules to modify the rules regarding frequency hopping spread spectrum systems operating in the 2400-2483.5 MHz band ("2.4 GHz band"), to permit digital transmission technologies to operate under the spread spectrum rules, and to eliminate the processing gain requirement for direct spread spectrum systems.² Proxim supports some aspects of the Commission's proposals and opposes others.

In particular, and undoubtedly unintended, the Commission's proposed changes to the frequency hopping spread spectrum rules could be interpreted as undercutting the rule changes adopted in the First Report & Order in this proceeding. These changes must be clarified, as discussed below. With respect to digital transmission technologies, Proxim supports the Commission's approach to allow more flexible use of the 2.4 GHz band, but urges the Commission to permit a total maximum power of 1W for such

¹ Proxim is a world leader in wireless local area networking devices and an active participant in this proceeding and supports several major wireless data standards initiatives, including IEEE802.11, OpenAir, the HomeRF Working Group (SWAP), Bluetooth and HiperLAN.

² See Amendment of Part 15 of the Commission's rules Regarding Spread Spectrum Devices; Wi-LAN, Inc, Application for Certification of an Intentional Radiator Under Part 15 of The Commission's Rules, FCC 01-158, ET Docket No. 99-231, DA 00-2317, at 1 (¶ 1) (released May 11, 2001)[hereinafter "FNPRM"].

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INTRODUCTION

The *First Report and Order* (“*First R&O*”) in this proceeding amended Part 15 of the Commission’s rules for frequency hopping spread spectrum devices in the 2.4 GHz band to allow frequency hopping spread spectrum transmitters in the band to use bandwidths between 1 MHz and 5 MHz at a reduced power output of up to 125 mW.³ Additionally, systems operating within these parameters were permitted to use as few as 15 non-overlapping channels, provided the total span of the channels met or exceeded 75 MHz.

Various parties petitioned the Commission for either clarification or reconsideration of its *First R&O*.⁴ Petitioners requested that the rules be expanded to allow frequency hopping systems in the 2.4 GHz band with bandwidths of 1 MHz or less to use the same number of hopping channels, 15, as the larger bandwidths. The Commission agreed with Proxim that a petition for reconsideration or clarification was not the appropriate vehicle for dealing with the issues raised by Petitioners.⁵ Rather, the Commission decided to consider the matter in the *FNPRM* and now proposes to amend Section 15.247 to incorporate the changes proposed by the Petitioners.

Additionally, after the *First R&O*, several parties claimed their digital technologies shared characteristics with spread spectrum systems, but lacked coverage under Section 15.247. Believing benefits may exist in including these systems, the Commission seeks in its *FNPRM* to include such digital technologies in its spread spectrum rules.

Thus, the Commission has set the stage for a comprehensive review of the application of its fifteen-year old spread spectrum rules, which Proxim welcomes. Naturally, Proxim agrees with the Commission’s assessment that the spread spectrum rules have been a resounding success. The success has not resulted from the specific provisions of the rules, which often have lagged far behind the state of technological development. Rather, the chief success of the rules has been in the underlying philosophy of the Part 15 unlicensed bands. As the Commission begins again to update the specific provisions of the Part 15 rules, it must not undercut that underlying

³ *First Report and Order*, ET 99-231, 15 FCC Rcd 16244 (2000).

⁴ See *Joint Petition For Clarification or, in the Alternative, Partial Reconsideration*, submitted October 25, 2000, by 3 Comm, Apple Computer, Cisco Systems, Dell Computer, IBM, Intel Corp., Intersil, Lucent Technologies, Microsoft, Nokia Inc., Silicon Wave, Toshiba America Information Systems, and Texas Instruments [hereinafter “Petitioners”].

⁵ See *FNPRM* at ¶ 12 (agreeing with comments filed by Proxim and Mobilian Corporation).

philosophy, which permits sharing of a common spectrum resource with a minimum of regulatory intervention.

DISCUSSION

I. The Commission's Frequency Hopping Proposal Could Lead To Systems That Spread Less And, Therefore, Increase The Potential For Interference.

Proxim agrees that, in appropriate circumstances, it would be beneficial for frequency hopping devices to be able to avoid certain occupied areas of the frequency band. Proxim, however, disagrees with both the Petitioners' premise that the current regulations worsen interference by compelling multiple systems to operate predominantly in the same spectrum and the notion that the current rules negate the opportunity for frequency hopping systems to use adaptive hopping techniques.

Rather, the current rules promote the spreading of the information content over a wide bandwidth, specifically to reduce the potential of interference to other receivers by generating a noise-like signal. While it is possible to imagine specific situations in which better spectrum sharing can be achieved through other means, the basic principles of spread spectrum remain appropriate for spectrum sharing among unlicensed and uncoordinated systems. The proposed rule change, it should be recognized, will lead to systems with less spreading and, therefore, increased interference potential to other receivers.

Additionally, Proxim disagrees with the contention of Petitioners that "the requirements effectively negate the opportunity for frequency hopping systems to use adaptive hopping techniques as allowed in Section 15.247(h) because there is only 83.5 MHz of spectrum available in the 2.4 GHz band." *Id.* It is only when adaptive hopping is narrowly defined as hopping using less than the total allowed spectrum that the existing rules are any impediment. There are frequency hopping technologies, for example the HomeRF wireless LAN standard, that use effective adaptive frequency hopping in the 2.4 GHz band while still conforming to the FCC's rules.

II. The Choice of 15 Channels As The Preferred Number Of Non-Overlapping Channels Required To Span 75 MHz Of Spectrum Is Arbitrary

Proxim questions the Commission's choice of 15 channels as the preferred number of non-overlapping channels required to span 75 MHz of spectrum. Proxim suspects that it was Petitioners' desire to make use of the reconsideration mechanism that drove their request for frequency hopping systems to make use of only 15 channels, since wideband frequency hopping systems must use 15 non-overlapping channels spanning 75 MHz of spectrum. *See* § 15.247(a)(1)(iii). Because this issue is not to be resolved in a reconsideration proceeding, the rationale for the choice of 15 channels now appears completely arbitrary.

To support its proposal for 15 channels, however, the Commission points to the 902-928 MHz band, in which frequency hopping devices using 250 kHz of spectrum need only use 25 frequency hopping channels. This encompasses 6.25 MHz out of the total 26 MHz in the band, or 24% of the band. Use of this precedent is flawed, however, since even in the 2.4 GHz band, a system could use adaptive hopping of the type envisioned by the Petitioners if the hopping channels were less than 1 MHz wide. That is, the only restriction in the 2.4 GHz band is for the use of 75 hopping channels for bandwidths up to 1 MHz wide. Therefore, using the 250 kHz bandwidths as a comparison in the 902-928 MHz band is misplaced. Proxim finds more relevant the fact that for hopping bandwidths up to the maximum of 500 kHz, a system in the 902-928 MHz band must use 25 hopping channels. *Id.* This is 12.5 MHz of spectrum or 48% of the total bandwidth.

Still more relevant are the rules for the 5725-5850 MHz band. This band has 125 MHz of spectrum (close to the 83.5 MHz in the 2.4 GHz band, and a more relevant comparison than the only 26 MHz in the 902-928 MHz band) and the bandwidth of the hopping channels is 1 MHz, the same as the 1 Watt channels in the 2.4 GHz band. In the 5725-5850 MHz band a system is required to use 75 hopping channels, which, at the maximum bandwidth, is 75 MHz out of 125 MHz, or 60% of the available bandwidth. The current proposal, for the use of 15 channels for adaptive hopping, means that a 1 MHz hopping system could use only 15 MHz out of the total of 83.5 MHz available. This use of only 18% of the band is less than any of the other precedents examined (24%, 48%, or 60%), and is far less than the most reasonable comparison of 60% coming from the examination of the 5725-5850 MHz band.

III. The Proposed Rules Must Accommodate Wideband Frequency Hopping Systems Permitted By The First Report & Order.

The rule modification proposed by the Commission would allow the use of 15 non-overlapping channels only when the hopsets are being modified as in 15.247(g). This means that any system using 15 channels must recognize the existence of other users and adapt its hopset to avoid hopping in occupied channels.

A system using 5 MHz channels and 15 non-overlapping channels will occupy nearly the entire available 2.4 GHz band. There is no room available for avoiding the use of occupied channels. Therefore, the proposed new rule can be interpreted to be inconsistent with Section 15.247(a)(1)(iii) modified in the First Report & Order in this proceeding. That is, in its worst light, the proposed 15.247(a)(1)(iii) would make illegal the operation of devices that the FCC just made legal in August, 2000. This result cannot have been intended by the Commission.

Accordingly, Proxim offers the following suggestions. First, the wording of 15.247(a)(1)(iii), as adopted in the First Report & Order should be restored. Next, adaptive frequency hopping should be added to the rules as a new section unrelated to

the wideband frequency hopping rule change. Adaptive frequency hopping should not be specified in terms of the number of channels permitted. Rather, it should be specified in terms of the percentage of the total available spectrum that that hopping device must occupy. In parallel with rules for the 5725-5850 MHz band, Proxim recommends that 60% of the band is a reasonable number. A requirement that frequency hopping systems use more than 50% of the available bandwidth is also consistent with 15.247(h) of the Commission's rules. Multiple frequency hopping systems would not be able to coordinate their activities to avoid the simultaneous occupancy of individual hopping frequencies so that, for example, one hopping system used only the lower portion of the band while another system used only the upper portion.

With respect to power levels, the Commission has proposed to limit output power to 125mW for devices that adapt their hopsets, but has offered no justification for such a limit. In fact, Proxim can see no justification for abandoning a 1W total power limit. Indeed 1W is allowed for the 5725-5850 MHz band and there is no need to treat the 2.4 GHz band any differently. It is likely that the applications that would derive the most benefit from adaptive hopping (applications like voice that cannot count on retransmissions to overcome channel interference) would also benefit from higher powers to be effective.

IV. Digital Transmission Systems In The 2.4 GHz Band Should Be Permitted At A Maximum Total Power Of 1 Watt.

Proxim agrees with the approach the Commission is taking with regards to allowing more flexible use of the 2.4 GHz band by including digital transmission systems under the spread spectrum rules.

As stated above with respect to adaptive frequency hopping, the Commission has provided no justification for limiting the output power of devices using digital transmission. Since the power spectral densities are the only relevant parameter for determining the interference potential of a system, Proxim can see no reason to reduce the power allotted to digitally modulated systems below that allowed for DS systems with the same spectral characteristics. *FNPRM* at ¶ 17. This is especially true considering that new types of digital transmission technologies will be useful in the outdoor environment. Therefore, a maximum total power of 1 W should be permitted for digitally modulated systems.

CONCLUSION

Consistent with the philosophy underlying the Part 15 rules, the Commission should continue to permit flexible use of the 2.4 GHz band by permitting a variety of modulation techniques. In particular, the Commission must not obviate its recently

adopted wideband frequency hopping rules or unduly restrict power levels for devices that use adaptive hopping techniques or digital transmission.

Respectfully submitted,
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August 27, 2001

Deborah Wiggins

From: Henry Goldberg
Sent: Monday, August 20, 2001 5:57 PM
To: Eric Schwalb
Cc: Joseph A. Godles; Julie Read; Deborah Wiggins
Subject: Prox comments

Importance: High



Comments to FNPRM 3.doc

This is the final of the Proxim comments, approved for filing by the client. Please put a signature block on it, sign my name, and file it on the due date, with the "as filed" version sent to Negus, Chinitz & Cafarella.

Proxim NPRM file