IEEE P802.11
Wireless LANs

Draft for Comments to FCC FNPRM OET Docket Nr. 99-231
(Clean version of RR ad-hoc group with highlighted amendment)

Date: July 11, 2001

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Abstract

This document is the result the following vote at the 1-3 PM meeting of the 802.11 Radio Regulations ad-hoc group.

Motion: To submit doc 11-01/391r4 to 802.11, 802.15 and 802.16 with the request to empower the regulatory ombudsman to finalize the document and send it to the addressees

Mover: Goldhammer
Second: Chauncey

> Motion to amend the document to remove 2.2.2

> Mover: Kuwahara
> Second: Lycklama
> 802.11 tally: Approve 3, Do not approve 0, Abstaining 0
> 802.15 tally: Approve 0, Do not approve 0, Abstaining 1
> 802.16 tally: Approve 2, Do not approve 2, Abstaining 1

The Chair interprets this motion as passed

Motion with amended document: To submit doc 11-01/391r4 to 802.11, 802.15 and 802.16 with the request to empower the regulatory ombudsman to finalize the document and send it to the addressees

802.11 tally: Approve 3, Do not approve 0, Abstaining 0
802.15 tally: Approve 1, Do not approve 0, Abstaining 0
802.16 tally: Approve 2, Do not approve 2, Abstaining 0

Amended document will be sent to the 3 Working Groups.

To: Miss Magalie Roman Salas,
           Office of Secretary,
           Federal Communications Commission,
           445 12th Street, SW,
           Washington, DC 20554

From: Vic Hayes,
           Regulatory Ombudsman, IEEE Project 802,
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Dear Miss Magalie,

In response to the questions of the Federal Communications Commission (the "Commission") in the Further Notice of Proposed Rule Making and Order (the "Notice"), document FCC 01-158, in the proceedings of ET Docket No. 99-231 the following entities offer their Comments:

[IEEE project 802, the LAN/MAN Standards Committee]

[- IEEE 802.11, the Working Group for Wireless Local Area Networks]

[- IEEE 802.15, the Working Group for Wireless personal Area Networks] and

[- IEEE 802.16, The Working Group for Metropolitan Wireless Networks] (the "Committees").

The Committees welcome the proposed actions of Commission to improve the sharing capabilities for spread spectrum devices, to permit new digital transmission technologies and to remove the processing gain requirement for Direct Sequence Spread Spectrum devices.

The Committees support, in principal, the improved sharing capability in the shape of the adaptive hopping proposal. However, they feel that the requirement for a hop sequence review at 30 s intervals should be removed, and that waivers should be issued on those rules before the Order is released.

The Committees support the introduction of the new digital transmission technologies, but note with concern that the rules as proposed do not provide sufficient qualifications to provide the necessary sharing capabilities.

1   Introduction of the Committees

All Committees operate under the rules of the Institute of Electrical and Electronics Engineers (IEEE) and the IEEE Standards Association (IEEE-SA). They are part of IEEE project 802, called the Local and Metropolitan Area Networks Standards Committee (LMSC). LMSC is sponsored by the IEEE Computer Society.

1.1   IEEE

The IEEE is a non-profit, technical professional association of more than 350,000 individual members in 150 countries.

Through its members, the IEEE is a leading authority in technical areas ranging from computer engineering, biomedical technology and telecommunications, to electric power, aerospace and consumer electronics, among others.

Through its technical publishing, conferences and consensus-based standards activities, the IEEE

produces 30 percent of the world's published literature in electrical engineering, computers and control technology,

holds annually more than 300 major conferences and

has more than 800 active standards with 700 under development.

The IEEE is made up of 10 Regions, 36 Technical Societies, four Technical Councils, approximately 1,200 individual and joint Society chapters, and 300 Sections.

1.2   IEEE-SA

The IEEE Standards Association (IEEE-SA) is an international membership organization serving today's industries with a complete portfolio of standards programs.

The IEEE-SA has two governing bodies: the Board of Governors and the Standards Board. The Board of Governors is responsible for the policy, financial oversight and strategic direction for the Association including two very important documents:

- IEEE Standards Association Bylaws

- IEEE Standards Association Operations Manual

The Standards Board has the charge to implement and manage the standards process, such as approving projects.

IEEE-SA members - both individual and corporate - continue to set the pace for the development of standards products, technical reports and documentation that ensure sound engineering practices worldwide. Membership in the IEEE-SA demonstrates to industry, its regulatory bodies and to customers, strong support of an industry-led consensus process for the development of standards and operating procedures and guidelines that:

- facilitate trade and commerce

- create and expand markets

- increase competitiveness in industry

- foster quality design and manufacture

- safeguard against hazards

1.3   LMSC

IEEE Project 802, Local and Metropolitan Area Network (LAN/MAN) Standards Committee has the basic charter to develop and maintain networking standards and recommended practices, using an open and accredited process, and to enable and advocate them on a global basis.

LMSC was formed in February 1980 and has met at least three times per year as a Plenary body ever since that time. LMSC has grown from a participation of 500 individuals in the 90s till over 1000 individuals in the Plenary sessions in 2001.

Products of LMSC are the IEEE 802.3 or Ethernet standards, IEEE 802.5 or Token Ring standards and the IEEE 802.11 or Wi-Fi standards. They all have been adopted by the ISO/IEC Joint Technical Committee 1 (JTC1) as International standards.

1.4   [IEEE 802.11

IEEE 802.11, the Standards Working Group for Wireless Local Area Networks, is responsible for developing Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) based Wireless Local Area Network (WLAN) standards within LMSC. IEEE 802.11 was formed in July 1990 and has produced the ISO/IEC 8802-11:1999 (IEEE 802.11:1999) standard with two supplements. With supplement 802.11b, Manufacturers can build devices for operation at data rates of 11 million bits per second (11 Mbit/s) using radio at 2.4 GHz. These devices can be used in the home, the enterprise and at public places such as Conference areas, Hotels and Airports to surf the Internet or connect to the Enterprise Intranet.

With supplement 802.11a, devices can be built operating at between 6 Mbit/s and 54 Mbit/s using radio at 5 GHz.

This Committee is using its own product during its conferences 6 times a year. Some Radio Access Points, Radio PC cards in the laptops of the members, a file server and a fast Internet connection enable the members to work efficiently and paperless. At its May 2001 meeting, for instance, 350 members could get the documentation in a matter of seconds from the file server or from the Internet. Without the network, copies would have been ordered, distributed and collected, normally requiring a lead time of at least 4 hours if a high speed copy machine was available on premises, or 8 hours if the copies had to be ordered at a copy service.

This Committee has 5 projects, 1) to enhance to WLAN standard with improved Quality of Service capabilities, 2) to write a Recommended Practice for an Inter-Access Point Protocol, 3) an additional radio entity for higher than 20 Mbit/s data rates in the 2.4 GHz band, 4) to enhance the standard with Dynamic channel selection and transmit power control, and 5) to enhance the standard with improved security capabilities. A study group is proposing a project to arrive at a single global 5 GHz standard.

At the beginning of the July 2001 meeting, 802.11 has [200] members, [200] observers building membership. Those individuals are sponsored by [80] companies.

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1.5   [IEEE 802.15

IEEE 802.15, the Standards Working Group for Wireless Personal Area Networks, is responsible for developing Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) or other access method based standards for short distance wireless networks within LMSC. IEEE 802.15 was formed in [July 1999]. The group has four projects: 1) a WPAN standard for Bluetooth, 2) a co-existence guideline for license exempt devices, 3) a High rate WPAN standards and 4) a low rate WPAN standard.

At the beginning of the July 2001 meeting, 802.15 has [60] members, [60] observers building membership. Those individuals are sponsored by [40] companies.

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1.6   [IEEE 802.16

IEEE 802.16, the Standards Working Group for Broadband Wireless Access Networks (or Wireless Metropolitan Area Networks), is responsible for developing standards and recommended practices to support the development and deployment of fixed broadband wireless access systems. IEEE 802.16 first met in July 1999. The group has four projects: 1) 802.16, Air Interface for 10-66 GHz, 2) 802.16a, amendments to the MAC layer and an additional PHY layer for 2-11 GHz Licensed Frequencies, 3) 802.16b, amendments to the MAC layer and an additional PHY layer, License-Exempt Frequencies, with a focus on 5-6 GHz and 4) Recommended Practice for co-existence amongst 802.16 and 802.16a devices.

At the beginning of the July 2001 meeting, 802.16 had 137 members, 97 others eligible for membership. Those individuals were sponsored by over 120 companies.

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2   Comments

2.1   Adaptive Hopping

The Committee applauds the Commissions initiative to reduce interference between Frequency Hopping Spread Sectrum systems and other systems for the support of IEEE 801.11 and IEEE 802.15. The goal of the proposed modifications to FCC Part 15.247 requested by the Joint Petitioners[1] was, and is, to persuade the FCC to minimize the potential for unnecessary interference between occupants of the 2400-2483.5 MHz band in a way that is best for all its occupants, present and future, by seeking a modification of Part 15.247 of the FCC's rules to make the use of adaptive frequency hopping techniques practical and technically feasible in the 2400-2483.5 MHz band.

There are a number of major, distinct classes of communications devices presently operating in, or being targeted at that band: IEEE 802.11b/g, Bluetooth (IEEE 802.15.1), IEEE 802.15.3, IEEE 802.15.4, HomeRF, and some 2.4 GHz cordless phones, in addition to microwave ovens, which, while not communications devices, can present potentially significant sources of interference.

The intent of the Committees is to enable "low power, narrowband FH devices," such as Bluetooth to elect to reduce their number of hopping channels from the current minimum of 75 hopping frequencies to some reduced hopset of <75 by employing intelligent, adaptive hopping algorithms to significantly improve their ability to coexist with IEEE 802.11b/g, IEEE 802.15.3, IEEE 802.15.4, and other "static, wideband" systems, as well as eliminating problems with interference from microwave ovens.

The use of such intelligent, adaptive hopping algorithms will enable such frequency hopping devices to recognize the presence of, and intelligently avoid interference from and to, other occupants of the band.

It should be noted that this approach should be rather compelling, from the perspective of the IEEE 802.11b, IEEE 802.11g , IEEE 802.15.3, and IEEE 802.15.4 device communities, as this benefit will come "for free," since the changes will happen in Bluetooth (IEEE 802.15.1) with no changes required in the IEEE 802.11b, IEEE 802.11g and IEEE 802.15.3 and IEEE 802.15.4 devices.

Since there are large numbers of IEEE 802.11b devices already fielded (and those numbers will continue to grow rapidly by all projections), IEEE 802.11g and IEEE 802.15.3 and IEEE 802.15.4 will begin to be deployed in the relatively near future, and projections indicate that 10's to 100's of millions of Bluetooth devices will be fielded in the next couple of years, it is imperative that everything possible be done to enhance the ability of Bluetooth and those other occupants of the 2400-2483.5 MHz band to coexist.

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[1] See paragraph 5 of the Notice, *Joint Petition For Clarification or, in the Alternative, Partial Reconsideration*, submitted on October 25, 2000, by 3Comm, Apple Computer, Cisco Systems, Dell Computer, IBM, Intel Corporation, Intersil, Lucent Technologies, Microsoft, Nokia Inc., Silicon Wave, Toshiba America Information Systems, and Texas Instruments.

2.1.1   Elimination of the 30 s re-evaluation rule

2.1.2   The Committee strongly suggests to the Commission that the "30 second re-evaluation"

requirement proposed in the NPRM be eliminated from the proposed rules changes as an

unnecessary component of an intelligent adaptive hopping algorithm that is expected to

adjust its behavior to the local environment. Earlier adoption of adaptive hopping and

method therefore

As the Committee has shown above ,there are already many devices in the field that deserve limitation of interference from hopping devices. The Commission, however, did NOT allow early adoption with Waivers, such as the Commission did for digital transmission systems. It would be advantageous if adaptive hopping could also be permitted under a waiver to the existing rules. This would allow Bluetooth implementers to proceed with interference avoidance measures without waiting for the full NPRM processing.

2.2   Digital Transmission Systems

In paragraph 15 to paragraph 18, the Commission discusses the introduction of Digital Transmission Systems. The Commission proposes in paragraph 16 to change the rules in the current spread spectrum bands at 915 MHz, 2.4 GHz and 5.7 GHz in such a way that that the new digital transmission system would be required to meet the same technical requirements as modified in this proceeding. The goal of the Commission to provide flexibility and certainty to promote the introduction of new and non-interfering products into the bands without the need for rules changes is whole heartedly supported. However, as shown in the following sections, the Commission needs to include an additional rule to prevent the new digital transmission systems from causing unacceptable levels of interference.

2.2.1   Power spectral density levels of digital transmission systems

In paragraph 17 the Commission requests comment on whether digital transmission systems should be allowed the same power levels as direct sequence spread spectrum systems[2].

The current direct sequence spread spectrum rules require the digital signal to be spread by a pseudo random code. Such operation has the characteristic that the power is spread over a wider frequency band than for normal modulations. The effect is that the power level density of the transmitted signal is remarkably lower than the total transmit power. All proposals in paragraph 15 of the Notice are based on digital transmission with the same characteristics. For instance, all modulations of the Direct Sequence Spread Spectrum specifications (1, 2, 5.5 and 11 Mbit/s data rate) in the IEEE 802.11 standard have, if they would use the full transmit power level of 30 dBm, a peak power spectral density of 20 dBm/MHz and a 23 dB bandwidth of 22 MHz.

If the current Commission's proposal for the new digital transmission systems with no more than the same power level limits as specified for direct sequence spread spectrum systems were adopted, then this would permit systems with a peak power spectral density of 8 dBm/3 kHz (that is equivalent to 33 dBm/MHz). A peak power spectral density of 33 dBm/MHz is 13 dB more than what is currently practiced for direct sequence spread spectrum systems. Accordingly, the proposed digital transmission sytems would heavily interfere with all currently deployed direct sequence spreading systems.

To prevent new systems from causing unacceptable interference to those devices in the 2.45 GHz band, the Committees propose the Commission to introduce a new requirement in addition to the existing requirement of

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[2] See beginning of paragraph 17 of the Notice: The rules for Part 15 spread spectrum systems limit maximum peak output power to 1 watt. In addition, the rules for direct sequence systems limit peak power spectral density conducted to the antenna to 8 dBm in any 3 kHz band during any time interval of continuous operation

8 dBm/3 kHz. The new requirement is to limit the peak power spectral density to use an additional limitation in dBm/MHz.

2.2.2   Power levels in the 5.7 GHz band

~~In paragraph 17 of the Notice, the Commision invite~~ <mark>comment</mark> ~~on whether digitally modulated systems should be allowed to operate at the same power levels as direct sequence spread spectrum systems, namely 1 watt maximum output power with power spectral density not exceeding 8 dBm in any 3 kHz band. The Comittee~~We agree with FCC to not reduce the peak power, the power spectral density or EIRP limits for the 5.7 GHz ISM band provided that the minimum bandwidth is 10 MHz.

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2.2.3   Alignment of the rules in 15.247 with the U-NII rules

The Commission seeks comment[3] on whether the same result would be achieved by amending the U-NII rules to include the 915 MHz and 2.4 GHz bands. The Committee supports this proposal, provided that the Commision expresses the power spectral density in the same unit (dBm/MHz) as in the U-NII rules and the level is specified comparable to the levels currently applied by devices approved through the Direct Sequence Spread Spectrum rules.

The Committee supports the proposal of the Commission to extend the upper limit of the U-NII band from 5.825 GHz to 5850 GHz. The Committee does not expect any detrimental impact of this change.

3   Summary

To be defined after completion of the Comments.

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[3] See paragraph 18 of the Notice