

**IEEE P802.11
Wireless LANs**

**Letter to Secretary of FCC on Wide Band Frequency Hopping
Proposed Rule Changes**

Date: July 8, 1998

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Abstract

Based on a petition from the HomeRF Working Group in November of 1998, the FCC has issued a Notice of Proposed Rule Making (NPRM) containing changes to the operating rules for FHSS radios in the 2.45 GHz ISM band. The changes include provisions for wider occupied channel widths (3 MHz and 5 MHz), overlapped FHSS channels, reduced transmit power levels, and mandatory higher hopping rates. A study group was formed to discuss the proposed rule changes.

The study group concluded that the use of multiply overlapped channels is not based on sound engineering analysis. This practice will increase self interference among WBFH systems, will increase interference with standard FHSS systems and impair the use of Clear Channel Assessment (CCA) as a means of spectrum sharing among standard FHSS networks. The study group also concluded that the proposed increase in the hop rate for FHSS systems using 3 MHz and 5 MHz wide channels will actually increase interference to existing FHSS and DSSS systems.

Finally, the study group found that the proposed reductions in transmit power for WBFH systems are misleading, since almost all existing WLAN systems today typically transmit 100 mW RF, well below the 1 W maximum allowed by the FCC. Further, it is very likely that WBFH systems will transmit at the maximum allowed power level in order to provide the spectral efficiency (2 bits/Hertz) and the degree of reliability required to support the audio and video applications sited by the HomeRF Working Group in their letter of Nov. 15, 1999. Therefore, WBFH systems employing 3 MHz wide channels operating at +25 dBm and 5 MHz wide channels transmitting at +23 dBm will have the practical effect of increasing interference to existing systems, or forcing those systems to operate at higher power levels. Neither result is desirable from the standpoint of facilitating high speed wireless networking.

The findings of the study group are described in the draft text of a letter to the Secretary of the FCC. The letter explains each of the points mentioned above, stipulates that IEEE 802.11 is opposed to the proposed WBFH rules changes contained in the NPRM (ET Docket No. 99-231), and recommends that the FCC reject the proposed WBFH rules changes.

Draft Text

July 8, 1999

Magalie R. Salas, Esquire
Secretary
Federal Communications Commission
445 12th St. SW
Washington DC 20554

Re: ET Docket No. 99-231

Dear Ms. Salas:

IEEE 802, the LAN/MAN Standards Committee ("the Committee"), is writing in regard to ET Docket No. 99-231: Amendment of Part 15 of the Commission's Rules for Spread Spectrum Devices. The Committee has studied the proposed changes regarding operating rules for Frequency Hopping Spread Spectrum (FHSS) devices. The Committee respectfully submits this statement in opposition to the proposed rules changes which would allow wider multiply overlapped (5 times) channels for FHSS systems.

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is a USA-based international professional organization with more than 325,000 members representing a broad segment of the computer and communications industries. The IEEE 802.11 Working Group has developed a standard for Wireless Local Area Networking (WLAN) in the 2400-2483.5 MHz band ("the 2450 MHz band"). The number of individuals and corresponding company sponsorships in the IEEE 802.11 Working Group evidences the strong interest in wireless local area networking. The Working Group currently has **XXX** voting members employed by **YYY** companies.

The Committee has reviewed the proposed changes in the Notice of Proposed Rule Making released by the Commission on June 24, 1999 (document FCC 99-149). We make the following comments:

- a. The use of heavily overlapped channels for FHSS systems will result in significantly increased interference between systems employing this method of channel selection. This is due primarily to two side effects of overlapped channels. First, nearly all commercially available FHSS systems employ non-coherent FSK modulation. Studies on the effect of partially overlapped channels on systems employing FSK modulation have concluded that the interference from a partially overlapped channel is more severe than either co-channel or adjacent channel interference. Secondly, regardless of the modulation method employed, spectrum sharing etiquette will be inhibited by the use of overlapping channels. Specifically, the effectiveness of Clear Channel Assessment (CCA) mechanisms is reduced. CCA will be reduced to simple energy detection, as opposed to carrier sense/code lock mechanisms which are far more effective means of facilitating spectrum sharing when two FHSS networks share the same frequency band.
- b. The Committee concludes that the proposed rules changes will result in systems which cause increased levels of interference to existing FHSS and DSSS systems. In general, a faster hop rate for FHSS systems represents a more severe interference threat than does an FHSS system employing a slower hop rate. We note that there is no regulatory prohibition against the use of systems which have higher hopping frequencies, but we are of the opinion that the Commission should not make higher hop rates mandatory. The higher hopping rates appear to be an attempt to mitigate the increased interference of the proposed wider channels. However, this measure actually increases the probability of interference to more channels of existing standard FHSS and DSSS systems.
- c. In addition, we find that the proposed reductions in transmitted RF power for systems using 3 MHz or 5 MHz channels (collectively referred to as Wide Band Frequency Hopping, or WBFH systems) will not effectively offset the impact of wider occupied channels. This is true because nearly all WLAN systems sold today operate well below the allowable FCC limit of 1 W for transmitted power. Current systems typically transmit about 100 mW. However, we note that in its letter of November 11, 1998 to the Commission, the HomeRF Working Group indicated that it envisions systems having high spectral efficiency (2 bits/Hertz) which will be suitable for transmission of high quality audio and

video streams. In order to achieve reliable operation, such systems will very likely be required to operate at the proposed maximum allowable power levels. This will have the practical effect of either forcing systems based on current spread spectrum rules to operate at higher power levels, or to accept reduced range due to interference from WBFH devices. Neither outcome will promote the effective use of the spectrum for high speed wireless data networking.

- d. We further note that the resulting increase in interference described above will hinder market acceptance of high speed wireless networking product which operate in the 2.45 GHz ISM band. IEEE 802.11 already has developed a standard for high speed wireless networking which will meet all of the objectives expressed in the HomeRF Working Group's letter of November 11, 1998. We therefore are of the opinion that no changes in the Commission's rules for spread spectrum operation in the 2.45 GHz ISM band are required.

In summary, we find that the proposed rules changes for WBFH systems will result in high levels of self interference among systems employing these measures due to the increased level of interference resulting from the use of 5x multiply overlapped channels and the impairment of CCA mechanisms. Further, WBFH systems pose an interference threat to existing FHSS and DSSS systems due to a mandatory increase in hop rate and the higher transmitted power levels which will be required for reliable operation of these systems. We are therefore opposed to the proposed rule changes for FHSS systems and urge the Commission to reject these measures.

Respectfully,

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