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**IEEE P802.11**  
**Wireless LANs**

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**To:** Mr. Jamshid Khun-Jush, Chairman, ETSI Project BRAN  
Mr. Masaaki Mitani, Chairman, MMAC 5 GHz Project

**Cc:** Mr. Tomoki Ohsawa, Chairman of MMAC Wireless Ethernet WG  
Jim Carlo, IEEE P802, Chairman  
Howard Frazier, IEEE P802, Recording Secretary  
Mary Shepherd, IEEE Standards Department, Intellectual Property Manager

**Date:** January 26, 1999

**Enclosures:** Draft Standard P802.11a/D5.3  
doc802.11-99/42r1  
doc802.11-99/124

**Subject:** An update on 802.11 OFDM PHY status and on IP issues

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Dear BRAN and MMAC officers and members,

We would like to bring you an update on the status of the 802.11a physical layer and on the changes which were incorporated during the March and May 1999 meetings. Some of the changes made reflect proposals brought by BRAN and MMAC members. In the following we shall list the changes and the rationale to those. We hope that after studying the rationale you will adopt the changes and by that we shall maintain and enhance the alignment of the physical layers of our projects.

- 1) Following a request from MMAC, we increased the duration of the short training sequence to ten repetitions of the short sequence, bringing it to 8 microseconds. This makes the duration a multiple of 4 microsecond, which eases MAC design. Another benefit is that it gives more time for antenna selection, if antenna diversity is implemented.
- 2) We adopted a proposal by BRAN to change the subcarrier phases of the short training sequence ( $S_{-26,26}$  in our notation) to values suggested by BRAN. The new short training sequence has better peak-to-average-power-ratio properties and better dynamic range than the previous 802.11a short training sequence. On the other hand, we declined, after lengthy discussion, BRAN's proposal to invert the polarity of the last repetition of the short training sequence ( $t_{10}$  in our notation). The main reason is that relying on the detection of this phase reversal in order to detect the transition from short to long training sequences demands, in the case of selection antenna diversity, to make the decision on the preferred antenna some 3 microseconds earlier. This hardly leaves time for detecting signal's presence and comparing both antennae. The discussion we conducted on this issue is captured in an attached document 99/124. We hope that after studying the rationale for our decision, you will adopt our approach of not inverting the last short subsequence.
- 3) We accepted BRAN's proposal to state in the standard that the symbol clock and the carrier frequency shall be derived from same reference oscillator. This is a natural design choice for a portable equipment, and it improves the performance and in the carrier tracking loop.

nonadjacent subcarriers. The second permutation reorders the bits within each subcarrier to ensure that there are no long runs of coded bits mapped onto least significant bits in the constellation. The second stage was added after showing that it provides some advantage with 16QAM and a significant advantage with 64QAM constellations, especially in multipath conditions. Further data supporting this decision is found in document 99/47r1. Please note that the text describing this change was incorrect in draft 4.0 and 5.0 and was corrected in Draft 5.3.

- 6) We rotated the points of the BPSK constellation to lie along the "I" quadrature axis. This change does not affect performance, but simplifies the implementation in the receiver. This change applies also to the subcarriers of the long training sequence, which are derived from the BPSK set.
- 7) Few 802.11-specific changes were made – we increased the SIFS (short inter-frame space) to be 16 microseconds and the Slot Time to 9 microseconds for ease of implementation. We changed the location of the RATE bit-field within the SIGNAL field so that it will become available to the receiver earlier.

We would like to take this opportunity to thank the BRAN and MMAC members' for their participation in the March and May 1999 meetings and their contributions, which enabled us to improve our draft standard. You will find all these changes incorporated in the draft standard 802.11a/D5.3, which is enclosed. We will be glad to receive your comments as a part of our recirculation ballot.

The 802.11a is currently in a Sponsor Ballot phase. We have processed most of the comments during the May 1999 meeting, and we shall process the remaining issues before end of May. In June we intend to send the updated Draft to a Recirculation Sponsor Ballot.

#### **Cross-committee IP issues**

A concern was expressed during May 1999 meeting about the IP implications of the changes introduced. We are not aware of any IP related to those specific changes. For a longer term solution, 802.11 will issue letters to all 802.11 members and the parties which submitted IP statements related to 802.11a in the past, asking them to review the 802.11a draft in its current status for possible patents required to practice the standard. If so, we shall ask them to submit a letter to the chair of 802.11 stating who the owner is, and if the owner is the company of the members, submitting the required statements from the IP manager to the IEEE IP manager. In the letters we shall ask the patent owners to extend their assurance to provide an access to their patents on a reasonable and non-discriminatory terms also to implementers devices implemented according to the related BRAN and MMAC standards.

We would like to ask BRAN and MMAC officers to take similar action within their committees, in order to ensure that 802.11a implementers will enjoy the reasonable and non-discriminatory terms assured to the BRAN and MMAC standard implementers

Sincerely,

Vic Hayes, Chairman IEEE P802.11,  
Standards Working Group for Wireless LANs

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