IEEE P802.11
Wireless LANs

Liaison Letter from ETSI-BRAN – Nov 3, 1998

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ETSI EP BRAN Plenary ***Document PLN1109a***

To: **Mr. Vic Hayes, Chairman IEEE 802.11, Standard Working Groups for WLAN**

Cc: **Mr. Naftali Chayat, 802.11 TGa Chairman**
Mr. K. Koga, MMAC, Japan
Date: **November 3, 1998**
Subject: **Alignment of physical layer specification between HIPERLAN/2 and IEEE 802.11**

Dear IEEE 802.11 Officers and Members,

EP BRAN received your Liaison statement of October 1998 on "An Update and an offer to use Draft as base material" with interest. The ETSI BRAN Plenary would like to inform you on the outcome of the October meeting and ask you to consider the following in your forthcoming meeting in November 1998.

1) We decided on the working assumptions regarding basic OFDM parameters and we made a pre-decision on the carrier spacing. In an interim meeting in December 1998 we will finalise these working assumptions.
2) With respect to OFDM parameters we made the following choices which in our opinion are very well harmonised with the basic parameters of Draft Standard IEEE802.11.
   FFT size:
   64 points

   The number of used sub-carriers:
   48

   The guard interval:
   800 ns

   Sub-carrier modulation:
   BPSK, QPSK, 16QAM, possibly 8PSK and optionally 64 QAM

   Demodulation in sub-carriers:
   Coherent

   FEC:
   A convolutional code with constraint length 7 and rate ½ is chosen. By puncturing this code, the required code rates ½, ¾ and possibly 2/3 will be obtained. Code rate rates 1/3 or ¼ might be needed to provide more protection for short control PDUs. The code rates shall be selected in such a way that each PDU should be mapped into an integer multiple of OFDM symbols. The current assumption on a data PDU size is 54 bytes. In addition to this mandatory coding scheme, we decided to keep the door open for other optional coding schemes and to provide means in the

protocol in order that such schemes could be included in the future versions of the physical layer technical specification.

Interleaving:

We could not decide if the interleaving is to be done OFDM symbol wise or PDU wise. We need more investigation regarding this issue which is an action point for the interim meeting of the PHY TS Rapporteur Group in December.

Oscillator accuracy:

+/- 20 ppm

Spectral shaping:

We find your approach, to withdraw the time windowing specification and to introduce constellation accuracy test specifications in combination with spectral mask a reasonable approach and have decided to adopt it. As you stated, this enables the manufacturers to use time-domain windowing or frequency-domain filtering in the implementation.

Training sequence:

Due to the centralised DLC protocol applied to HIPERLAN/2, we need three different preambles. The first one is for the beginning of MAC frame, which could have the same structure as the first part of the training sequence proposed for IEEE 802.11, i.e. AGC symbol(s), the symbols for coarse frequency and timing estimation and the long symbol for fine frequency offset and channel estimation. It does not need the training part SIGNAL, because the signalling of PHY mode will be performed in other part of the protocol. The second preamble for each downlink burst, which has the same structure as the long symbol T1 in IEEE 802.11 proposal. The third training sequence for each uplink burst will use also this symbol. It is not clear at the moment if the symbols for coarse frequency offset and timing are needed for downlink and uplink bursts. In addition, the need for AGC symbol(s) in uplink bursts is under discussion.

Phase tracking:

We agree that a phase tracking mechanism is needed due to the use of coherent demodulation. The initial investigations performed by some members of the PHY TS Rapporteur Group show that there is no need for pilot symbols to do phase tracking. But we need more results to make a final decision which technique is preferable for that purpose, i.e. a pilot symbol aided scheme versus a non pilot based one. This issue is to be discussed at our next December PHY TS interim meeting.

3) We have decided for a channel spacing of 20 MHz due to the reasons given below:
A bandwidth of 150 MHz in the range 5.15 – 5.3 GHz is currently allocated for HIPERLAN devices in Europe. The emitted spurious power below 5.15 GHz and above 5.3 GHz must be less than –33 dBm/100kHz. By assuming a transmit power of 200 mW, an attenuation of at least 35 dB has to be achieved at both edges of the HIPERLAN frequency band. Simulation results show that the spacing of the leftmost channel as well as the spacing of the rightmost channel from the band's edges have to be in the order of 22 MHz. The aforementioned results have been achieved by using a nonlinear model for a class AB power amplifier with an out put backoff of 5.5 dB. Therefore the number of radio channels achieved by an 18 MHz channel spacing is equal to that achieved by a channel spacing of 20 MHz. By choosing the latter channel spacing, six radio channels could be obtained in 150 MHz allocated band and the distance of the outmost channel from each band edge could be increased to 25 MHz, which relaxes the backoff requirements on the PA. Using the HIPERLAN/2 PA models, we believe that the outmost channels in UNII band need even more distance from the band edges if practical PA backoff values will be applied. In the case of a channel spacing of 20 MHz, it would be possible to obtain 8 radio channels for the 200 MHz band starting at 5.15 GHz (lower and middle U-NII bands) and in parallel to provide enough spacing for the outmost channels from the band edges.

4) We did not decide on the sampling rate that determines the bit rate supported in a radio channel. There are two different alternatives. A rate of 20 Msamples/s results in a reduced adjacent channel interference (ACI) that might be translated in an increased overall system capacity. A higher sampling rate (e.g. 22 Msamples/s) will increase the instantaneous bit rate in one radio channel, but results in an increased ACI that might be translated in degradation of the overall system throughput. It might also produce some mixed frequency products which make the RF implementation more complex. We intend to decide on this issue in the PHY interim meeting.

Hopefully IEEE 802.11a and HIPERLAN/2 communities could resolve, if not all, but at least some of the minor remaining differences with respect to OFDM parameters until the joint meeting between two projects in January 1999. We also expect that a fruitful discussion on channel spacing and sampling rate issues will be started between two communities, and believe that an agreement on them is reachable. Some of our expert team will attend the IEEE 802.11 meeting in November to discuss these issues with the 802.11 members.

In view of the fact that the joint meeting in January 1999 has been organised to finalise the alignment procedure of physical layer specifications, we believe that the start of a formal approval process within IEEE triggered by the Committee Latter Ballot could make this alignment procedure difficult. It is mainly due to difficulties associated with modifying a draft versus modifying a proposal. Therefore we would like to ask you taking this into account in your forthcoming meeting in November.

Sincerely,

Jan Kruys, Chairman ETSI Project BRAN
Jamshid Khun-Jush, Co-ordinator of HIPERLAN type 2 Standard Area and PHY TS Rapporteur