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IEEE P802.11
Wireless LANs

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

Cc: Mr. Naftali Chayat, 802.11 TGa Chairman
Mr. Tadao Kobayashi Chairman of HSWA Subcommittee of MMAC-PC
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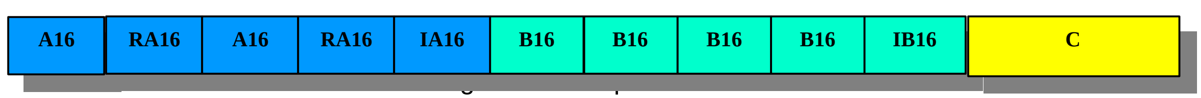
Date: April 20, 1998

Subject: Alignment of preamble between IEEE 802.11a and HIPERLAN type 2

Dear IEEE 802.11 Officers and Members,

The Plenary of the ETSI Project BRAN would like to inform you on the outcome of the BRAN#13 meeting in April 1999 regarding the technical specifications of the HIPERLAN type 2 physical layer. In a document sent together with this letter, the status of physical layer alignment among three communities IEEE802.11, MMAC and HIPERLAN-2 is given. One of the most important issues is the preamble design that we tried to get harmonised at the IEEE/BRAN joint meeting in Orlando, FL. Unfortunately, this effort was not successful.
As stated in our Liaison Statement in October 1998, HIPERLAN-2 system needs three different preambles due to the centralised MAC protocol applied to this system. The first one is for the downlink channel BCH (Broad cast CHannel) at the beginning of a MAC frame. From the functionality point of view it is similar to the PLCP preamble in IEEE802.11a, i.e. it could be applied for AGC, timing estimation, frequency offset and channel estimation as well as antenna diversity selection. The second preamble is needed for other downlink channels: FCH (Frame control CHannel) and data transport channels SCH (Short transport CHannel) and LCH (Long transport CHannel) and could be mainly used for updating existing channel estimation or performing a new channel estimation. It might also be used for time/frequency synchronisation purposes. The third preamble is needed for uplink channels: data transport channels SCH and LCH as well as RCH (Random access CHannel). It should support timing and frequency synchronisation, channel estimation, and if required by an access point, other additional functionalities as switched antenna diversity selection.
Two proposals were submitted to the HIPERLAN-2 Physical Layer Group. Both proposals were discussed and compared based on a set of criteria agreed at the last BRAN meeting for selection purposes. We could achieve a merged solution given below that includes the advantages of both proposals.

1) BCCH preamble



dB, and for B16 the PAPR is 2.24 dB and the dynamic range is 7.01 dB. The C part is the preamble applied to other downlink channels given below. The length of BCH preamble is 16 us and is equal to that of IEEE802.11a PLCP preamble and MMAC preamble. The rational behind the introduction of fields A and B in the preamble is to reduce the fals alarm probability by disinguishing between downlink and uplink preambels of HIPERLAN-2 and also by distiguishing between HIPERLAN-2 BCH preamble and an IEEE802.11a like preamble, when both devices are operating in the same geographical area at the same time.

2) FCH, SCH and LCH preamble for other downlink channels

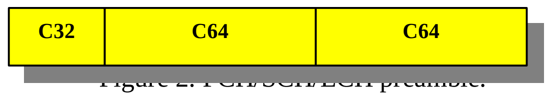


Figure 2. FCH/SCH/LCH preamble.

The symbols C64 is equal to the T1/T2 symbol defined in IEEE802.11 draft standard, and is defined as:

$C64_{-26\ldots26}$ = {1, 1, -1, -1, 1, 1, -1, 1, -1, 1, 1, 1, 1, 1, 1, -1, -1, 1, 1, -1, 1, -1, 1, 1, 1, 1, **0**, 1, -1, -1, 1, 1, -1, 1, -1, 1, -1, -1, -1, -1, -1, 1, 1, -1, -1, 1, -1, 1, -1, 1, 1, 1, 1}

3) RCH, SCH and LCH preamble for uplink channels

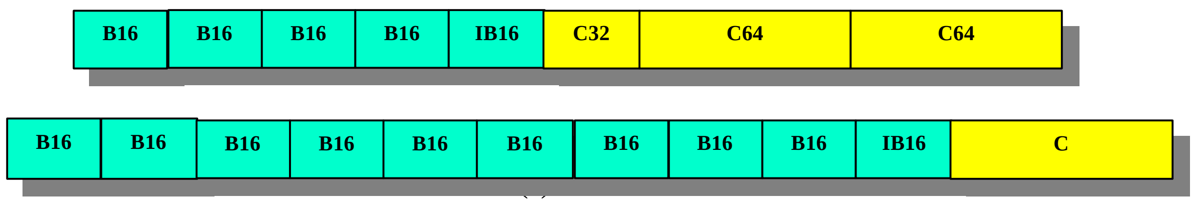


Figure 3. SCH/LCH/RCH preambles: (a) Option 1, (b) Option 2.

The C part is the downlink preamble given in 2) and the B16 symbol is the same B16 symbol used in BCH preamble given in 1). Option 2 is introduced to enable efficient smart antenna solutions at the access point. By ordering longer preambles in uplink channels, an access point assures that it has enough time and information to perform e.g. antenna switching. Which one of the preambles is used by a wireless terminal in an uplink channel will be decided by the access point and could be signalled by a respective bit in the MAC frame to the corresponding wireless terminal.

The solution BRAN community achieved for HIPERLAN-2 preamble could be considered as a further step toward a world wide harmonised physical layer for different systems currently being standardised in Europe, Japan and the USA for the operation in the 5 GHz band. The positions of subcarrier loading in B16 symbol are similar to that of the short symbols of IEEE802.11 a PCLP preamble. The reason, why the later ones are not used, is the higher PAPR (3.01 dB) and especially higher dynamic range (30.82 dB). We believe that the replacement of your short symbols by B16 symbol used in the HIPERLAN-2 is not only in the sense of further harmonisation of preambles, but also could have performance benefits for IEEE802.11a. Therefore we would like to ask you taking this into account in your forthcoming meeting in May 1999 in Japan. The sign inversion of the last short symbol in IEEE802.11a PLCP preamble is another item that might be considered in this meeting. The BRAN HL2 PHY group has identified the sign inverted last repetition of the short symbols is beneficial for improving timing detection accuracy, simplifying the synchronisation processing, increasing the receiver implementation flexibility (e.g. auto-correlation based or

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Date: April 15, 1999
Source: PHY TS Rapporteur
Title: HIPERLAN Decision List
Agenda item:

Parameter	H/2 Current working assumption or decision	Harmonised with IEEE?	Harmonised with MMAC-WATM-WG?
Channel spacing	20 MHz (decided)	Yes	Yes
Sampling rate	20 Msample/s (decided)	Yes	Yes
FFT length	64 (decided)	Yes	Yes
Number of used sub-carriers	48 data sub-carriers and 4 pilot sub-carriers (decided)	Yes	Yes
Sub-carrier modulation	BPSK, QPSK, 16QAM, optionally 64 QAM (decided)	Yes	Yes
Signal constellation and bit mapping	Decided	Yes	Yes
Demodulation	Coherent (decided)	Yes	Yes
FEC mother code	Convolutional code, rate ½ (decided)	Yes	Yes
Code termination	Method (decided), additional puncturing patterns to be decided at BRAN#13.5	No	Yes
Guard interval	800 ns corresponding to 16 time samples (decide)	Yes	Yes
PHY modes & code rates	7 modes (decided) 6, 9, 12, 18, 27, 36, 54 Mbps	Mainly yes 6, 9, 12, 18, 24, 48, 54 Mbps	Yes
Oscillator accuracy	+/- 20 ppm (decided)	Yes	Yes
Linkage of Oscillators	Generation of RF and baseband timing from the same reference oscillator	Yes	Yes

Interleaving	OFDM symbol wise (decided), permutation (working assumption)	Method Yes, Permutation No	Method Yes, Permutation No
Pulse shaping	TX power mask + modulation constellation accuracy (method decided, IEEE TX power mask and IEEE values for modulation accuracy working assumption)	Method Yes, Modulation accuracy values Yes, TX power mask Yes	Method Yes, Modulation accuracy values Yes, TX power mask No due to specific Japanese regulation matters