
IEEE 802.11
Wireless Access Method and Physical Specification

Tentative minutes
DSSS PHY Adhoc Group Meeting, Vancouver, B.C. Canada
Monday March 7 - Thursday March 10

ATTENDANCE LIST

Paul Struhsaker	Telxon/Aironet
Jim Roesch	Harris Corp.
Jim Renfro	Raytheon
Ti Mitsutomi	Sharp/SDI
Jeff Rackowitz	Intermec
Bob Achatz	NTIA
Maurice France	Turner Gold France
Mike Miceli	Motorola Semiconductor
Jan Boer	AT&T

Jeff Rackowitz voted as note taker

DS AGENDA

- Minutes
- Template
- Issues w/ template
- Polish issues
- Clear Channel Assessment (CCA)
- MAC/PHY Interface
- Resolution of Modulation

Minutes from January 1994 meeting in San Jose approved unanimously.

TEMPLATE DOC P802.11-93/232r1

Appendix: Item 2B Channelization - change KHz to MHz.

Maurice moved to open Modulation (14). Paul 2nd. Jim Roesch calls. Maurice 2nd.
8.0.0 passed

Paul moved that DOQPSK be removed and DQPSK be adopted as the 2Mb/s modulation standard. Maurice 2nd. Jim Roesch calls. Ti 2nd.
8.0.0 passed

Maurice moved to open DOQPSK offset (14a) and delete. Paul 2nd. Jeff moves to close Jim Roesch 2nd.
8.0.0 passed

Paul Struhsaker presents material on preamble and frame structure

Paul: If end of message (EOM) occurs in data, then there will be a premature packet termination and the CRC will be in the wrong spot. Can't use CRC to hunt for something. The PHY must deliver the CRC and MPDU in a reliable manner. End of energy isn't succinct. We should use a length indicator.

Precedence has been set with other PHYs. CRC16 or CRC32. CRC applies to service bits and length field. Change 8 bit vendor bits and service bits to 16 bit service field.

Jan: Template doesn't say "vendor bits" just says used at vendors discretion.

Paul: we should remove vendor statement.

Jan: feels that MAC will provide length and CRC. but it is not settled at this point. Info comes from MAC/PHY meeting discussion. If length and CRC is provided by the MAC, no problem using it. I don't need it but will use if available.

Maurice: Current method felt to be flawed. Divining rod to find water analogy. Feels only way is positive indication of message length. Likes current wording of bits but vendor indication should be removed.

Paul: If CRC fails, start looking for new unique word if new word but in the data - CRC will most likely fail.

Jeff: CRC doesn't match the frequency hop proposal

Jan: PHY software, MAC doesn't calculate preamble CRC

Jeff: CRC calculated differently for DS and FH.

Paul: We should define what we need and let it be worked. We should define what DS needs.

Jeff: Good point. FH may need this feature.

Paul: If we do rate change, must protect service field. If we were operating in a clean environment, we could use drop of energy as an end delimiter. This is not a good approach in our environment.

Fragmenting packets may be required - being discussion in the MAC.

Possible for DS - 4Mb/s, 8Mb/s rates. Lots of room to grow.

We should drop the end of message field. We are a one error system

Jim Roesch: 10e-5 system will experience packet errors but CRC in the preamble will help.

Jeff: What are service bits for?

Paul: Spreading code, modulation type, symbol rate changes, encryption, differentiation in the market above what 802.11 allows. Customers want 802.11 but extra service desired.

Jeff: Why is training sequence as long as it is?

Paul: needed for antenna diversity and lock. About 100 us needed.

Maurice: 46 us for CCA in the MAC simulation (2 X 23us). Tradeoff issue with MAC for sure.

Paul: Things hard to deal with in determining if channel is clear - rotating fans, aluminum can companies, stirring operations.

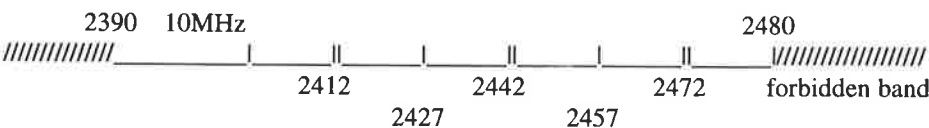
Paul moves to open all of Preamble length (18, 18a, 18b, 18c) 2nd Jim Roesch.
8.0.0 passed

Paul moves that 18 goes to 192 bits. 18a part C - delete 00001100 2Mb/s DOQPSK. 18a part D - delete text after service bits and add all 'zeros'.

Add 18a part E - Length field: 16 bit (2 octets). Add 18a part F - CRC field: 16 bit CRC applied over C,D, & E. Polynomial 1+ XE5 + XE12 + XE16 - CCITT CRC16. Delete 18b. Jim Roesch 2nd

8.0.0 passed

FORBIDDEN BAND SLIDE



Paul: Currently only 4 bands usable because of FCC. Concerned about 2472 since forbidden band is violated if standard is followed. 2472 could work with lower output power. The first lobe is the problem.

Maurice: Suggests that we wait on defining channels exactly until ready to send up for approval since it is subject to change by the FCC.

Paul motions to change Channel spectrum mask (12) as follows:

-30 dBc @ $\Delta f = \pm 11$ MHz to ± 22 MHz

-50 dBc @ $\Delta f \geq 22$ MHz

delete last line

Jim Renfro 2nd

7.0.1 passed

Jeff: Are DS data rates optional or mandatory?

Paul: Must receive both data rates but system can work at 1 Mb/s or 2 Mb/s or both.

Energy detection threshold (20a) (open issue)

Jan proposes to change Out of band spurious emissions (22) to Out and inband spurious emissions and remove In band spurious emissions on receive(22a). 2nd Jim Roesch

8.0.1 passed

RAMP UP/RAMP DOWN

Paul: designers would like this to be redefined. Envelope definition preferred. [figures shown]

Maurice: two aspects bounding and rate of change specified

Jim Renfro: Suggest 10-90% transition time max. Won't worry about spurs.

Maurice: max. and min.

Paul: 1-3 usec

Maurice: 1 us for spurious. 3 us for CCA.

Jim Renfro: Only care about max.

Jan: 1/2 usec causing problems? Will have to check.

Jim Roesch: Cap on control pin.

Maurice: Could be sources.

Paul: Control line - dynamically biased Class A eliminated.

Maurice: Nothing over 3 usec. 2 symbols. Only talking about rate of change.

Paul: Controllers X numbers deep. Processing pipeline in real system. Things are going on during ramp.

Mute point.

Jim Renfro: can't speed up processing pipeline - given.

Maurice: MAC wants number and build up. TX/RX turnaround etc. MAC wants CCA time to be divided down and defined.

Paul Motions:

23 TX/RX Transmit Power off $\leq 2\mu s$

Transmit Power on

TX power on ramp from 10% to 90% maximum power shall be no greater than 2 us

TX power off ramp from 90% to 10% maximum power shall be no greater than 2us.

Delete 23a and 24a. 2nd Jim Roesch

7.0.1 passed.

Paul: After 10 us, meet all requirements. Once you decide to switch RX to TX - you're committed. Time and effort spent on changing oscillator and VCO. Implementation specific. Spec. kills people who want simple receiver structure. Cheap gives 100 us RX/TX transition times.

Maurice: CSMA/CA for collision avoidance system.

[Figure drawn on overhead by Jim Roesch]

Switching time Rx to Tx (24). 10 us is difficult but anything longer will cause problems. Group feels that 10 us is aggressive but required for performance.

Idea presented by Paul:

0 - 10us - Meet spurious bounds.
 10 - 20 us - +/- 75 PPM
 20 - 30 us - +/- 25 PPM
 Paul: feels we should add extra numbers
 Jim Renfro: should do sanity check
 Paul: forcing implementation
 Jim Renfro: most of the spec. defines implementation.

MAC/PHY INTERFACE

94/61 - Jan plans to add this to the template except for wave form. Covers MAC/DS PHY interfaces.

Jim Renfro: Carrier sense could be gated with other things.
 Paul: One more line in case packet is too long.
 Maurice: in Case packet is too long need to have a recovery mechanism - this could be caused by S/W error.
 Jan: Refer to Jabber function.
 Paul: exposed interface could help to define interface for helping vendors define silicon.
 Maurice: Test issues, lots of work to define exposed interface if one is defined.
 Jim Renfro: Are you talking about electrical characteristics? I don't think we want to.
 Jan: Agrees. He will not detail further. Good enough.
 Maurice: How can RSSI and Signal quality be used or CCA? If we rely only on correlation then we have to decide if we only look for like PHYs.
 Jan: We detect energy then carrier with a signal quality. 92/37 defines why.
 Paul: With diversity, can't just look at strong signal, weak signal may receive better because strong signal may have a strong interferers.
 Jan: MAC wants to set the threshold.
 Jim Renfro: We can do CCA faster than is currently defined.
 Paul: -80 dBm to -40 dBm is the area that is important for CCA.
 [General Discussion of how to set RSSI]
 Maurice: CCA sensitivity = Energy detect threshold.

Jan Motions that we accept 94/61 for inclusion in the DS PHY template (93/232r2) and keep it open. Jim Roesch 2nd.
 8.0.0 passed

CLEAR CHANNEL ASSESSMENT (CCA)

[Maurice discusses his initial results on CCA. He is evaluating dynamic energy detect thresholds with slow integrator reference and faster integrator signal detect.]

Maurice: Papers 94/70, 94/53, 94/79 relating to CCA are worth reviewing.
 McDonald's paper (94/79) discusses four basic CCA approaches: hybrid, clock, power and packet.
 McDonald's paper shows poor false deferral performance on power CCA. Do we want to defer to anything else other than a like PHY?
 Coexistence proposed but not interoperability. Only method for coexistence is detect power. It is not a good idea to fix a threshold so we are looking at a riding threshold.

[Maurice show graphs on his laptop of long and short integrator with example data (i.e. short packets with long interferers etc.)]

Maurice: Graphs are of time constraints of short and long term filters 5 to 1 difference on the time constants. Short time constant used to detect. The faster we detect energy, the more prone we are to false alarms.

Jim Renfro: CFAR issue. Falling edge on filter should happen fast.
 Paul moved that we adopt as a baseline, Maurice's long term/short term filter method for determining the energy detection threshold and leave it open. Jim Renfro 2nd.
 8.0.0 passed.

Maurice: The preferred method is power in the channel. This is for microwave ovens and frequency hoppers. Power in the channel is the first indication that the channel is busy. Correlation would be the next indication that determines if the signal is a like PHY.

Jan: Wim's paper on power control will also effect the threshold. We need to see Wim's paper.

AGENDA FOR NEXT MEETING

CCA and close

MAC/PHY interface and close

Review Doc 94/50 Draft Standard Test for DSSS

