Tentative Minutes of the Frequency Hop Ad Hoc Group, September 1994

IEEE 802.11 COMMITTEE
August 29 to September 1, 1994

1:00 pm, Monday, August 29, 1994

Frequency Hopping PHY

Jim McDonald, the chair of the FH PHY working group, opens with the agenda for this meeting.

Agenda:

Secretary

Iwen Yao has volunteered to be the secretary of this meeting.

Clarify Unique Word

Some discussions on the Unique Word. The minutes of the July Meeting seems to have included part of the preamble into the Unique Word definition, 55550CBD.

Jim R moved a
Motion for clarification that 0CBD is the unique word.
second by Charlie J.
result: 7,0,1 Motion passes

Amend the minutes of the July Meeting to reflect this motion.

John McKown moves and Charlie Jenkins seconds to
Approve the minutes from the last meeting, with the unique word clarification.
Result: 5,0,2.

The Group also expresses its appreciation to Peter for doing a fantastic job on the minutes in July.

The second item on the Agenda is PMD Specifications

Jim McDonald: Work through PMD specifications including submissions as they apply to specific specifications.

EdG: New version of document 68, now on revision 3, will be available tomorrow.

JimM: We will start from section 9.5.7.

As the group goes through the agenda items as listed by the Chair, the Chair asked for members of group to indicate whether he or she has comments or new submissions. The following is a list of the Agenda items along with the response given by members who has something to say on each subject.

Exceptions for Mac PHY Interface/Other

9.5.7 PMD Operating Specifications General

9.5.7.1 Operating Freq. Range
EdG: has discussion

9.5.7.2 No of Channels

9.5.7.3 Channel center freq.
EdG: has discussion
Ray Martino: has comment

9.5.7.4 Channel Bandwidth
JimM: paper 111
JerryL: old paper and discussion

9.5.7.5 Hop Rate

9.5.7.6 Hop Sequences

9.5.7.7 Spurious In-Band Emissions in ISM Band
CharlieJ: Discussion
JerryL: Paper
JimM: papers 111 and 112
EdG: Comment

9.5.7.8 Spurious Out-of-Band Emissions (Out of ISM Band)

9.5.7.9 Modulation
JimM: papers 111 and 112

9.5.7.10 Channel Data Rate

9.5.7.11 Channel Switch Settling Time

9.5.7.12 T/R Switch Time

9.5.7.13 R/T Switch Time

9.5.7.14 Channel Availability per PAR (closed)

9.5.7.15 VSWR

9.5.8 PMD Transmit Specs

9.5.8.1 Transmit Power Levels
JimM: paper 114
EdG: 1mW min. issue.

9.5.8.2 Transmit Power Level Control

9.5.8.3 Transmit Spectral Shape
JimM: 110 on splatter problem
JerryL: old paper

9.5.8.4 Transmit Center Freq. Tolerance
JimM: comment, 111

9.5.9 PMD Receiver Specs

9.5.9.1 Spur free Dynamic Range
JimM: Power level issue, 111

9.5.9.2 Selectivity

9.5.9.3 Ch. BER

9.5.9.4 Rcvr Center Freq. Tolerance

9.5.9.5 Carrier Detect Response Time

9.5.9.6 Clock Recovery Time

9.5.9.7 Jitters Tolerance

9.5.9.8 Ramp up period and Ramp down Period

9.5.9.9 Preamble Definitions

9.5.9.10 Rcv Data Max Run Length, DC balance run length (bit Stuffing)
EdG: Should be specified in PLCP
226
112

9.5.9.11 Rcv Sensitivity
JimR: Included in Spur Free Dynamic Range (9.5.9.1)

9.5.9.12 Intermod

9.5.9.13 Desensitization

Jim R: Still have to address the timing.
JimM: Agrees. we all agree there are some reordering of paragraph numbers needed.
EdG: PLCP issue remains to be discussed.

Submission:
LarryZ: Revision to CCA proposal including some calculations
JimR: Group Delay specification

Starting to work through the PMD Specifications

9.5.7.1

EdG: The Center Frequencies for Europe and Japan are still open.
Discussions on this subject.
There may be other specs needs to be customized for individual regions.
Get input on this matter.
Europe may have different sets of regulation for different countries.

John McKown: Move to
Purge reference to non FCC regulatory requirements.
Jim R Second
Result: 6,0,3 Passed

LarryZ: concerned about the lack of specifications for other regions which may result in difficulties of sailing in those regions.

9.5.7.2
EdG: number of channels is set at 80. But Hop set only has 79.

The problem is channel 80 appears in Hop Tables.
Channel 1 is not used in the Hop Tables.
EdG will resolve this issue with Dean K.
Continue discussion on which channels should be included in the 79 channels.
Because of the FCC has a restrictive band immediately above 2.4835 MHz and the closest one below 2.4 GHz is 10 MHz below, we have more breathing room for guard band at the lower edge of the ISM band.

Motion to remove min column from 9.5.7.2
by JimR and second by EdG.
No discussion
result: 6,0,0 passed.

9.5.7.3
Ray Martino: comment on channel bandwidth. Should we specify the channel bandwidth relative to the absolute bandwidth rather than reference to the center frequencies as specified here?

JimM: issue on 20dB bandwidth or 99% bandwidth.
JerryL: propose to tie ANSI measurements on the bandwidth definition. And is specific spell out in European document (C63.4). 20dBc bandwidth measured by ANSI method at a measuring bandwidth of 100kHz.

JimM: 99% bandwidth if the FCC can be convinced, would allow more deviation to the FM waveform which would be advantageous.

LarryZ: Comment by JimR on restrictive band is correct that we should favor larger guard band on the lower side of the band. We should leave the frequency assignment as is.

CharlieJ: Clarify center frequency definition in the channel table.

Jim M: Motion to remove specific reference to center frequency.

JerryL: Change to 9.5.7.4 text
Motion to change the paragraph in section 9.5.7.4 from "specified operating center frequency" to "nominal operating center frequency".

Jim M: shows proposed text change in 111.

Discussion on the interrelationships amongst different parameters which needs to be specified. How to measure center frequencies? Use alternating 1,0 pattern. EdG mentioned tristate measurement of center frequency.

Jim M: one motion is to adopt text in doc111.

some discussions on 99% and 20dB bandwidth in the specs.
Jim M: intention of 99% bandwidth is to allow larger deviation if the FCC can accept it. Currently, 20dB restriction imposed by the FCC would impose a higher limit of deviation of the FM waveform.
JerryL: European standard specifically required the bandwidth to be measured by the ANSI method which is 20dB relative to the peak.

Jim M: 2 issues are 20dB/99% issue and the issue of reference to the center frequency.
JohnM: We have to phrase it very specifically.
More discussions on the issue of 20dB/99%.

Jim M: move to take 10-15 min break.

After the Break

JohnM moved that
The occupied bandwidth for the PMD is 1.0MHz. This must contain 99% of the emitted energy. The FCC may impose ...4.7.4 per 94/111 to ch bandwidth. Use this to replace existing wording in 9.5.7.4.
2nd by IwenY.

From 94/111:
"The occupied channel bandwidth for the PMD is 1.0 MHz wide. This 1.0 MHz must contain 99% of the emitted energy. The FCC may impose a further restriction on transmitted bandwidth requiring the 20 dB bandwidth, as measured with a spectrum analyzer and referenced to the magnitude at the center of the transmitted bandwidth to be less than 1 MHz.
The transmitter center frequency shall be within +-25ppm of one of the specified operating center frequencies listed in section 9.5.7.3. The following diagram (Fig. 9-11 of 94/068r3) illustrates the relationship of the operating transmitter center frequency to the occupied channel bandwidth."

EdG calls the question John M 2nd.
result: 6, 0,0 question called.
vote on motion
result: 4, 1,1 passed.

EdG: scratch Japanese requirements , table 9.12

JimM: HS group request for presenting a paper in the group.

9.5.7.5 Hop Rate

JimM: is it specified by MAC?

EdG: I believe we need to specify a minimum.
EdG: move to change the title to Minimum Hop Rate.

9.5.7.6 HOP sequence is closed

9.5.7.7 In-band emissions:

CJ: comment. In R2, p32 diagram and text is not consistent? In 9.5.8.3, diagram is not consistent with text. This comment is out of order. Maybe we should wait to discuss this when we pick up 9.5.8.3.

JL: Don't need to be specified here. I thought it should be specified in 9.5.8.3 as the transmit mask is specified. Move to eliminate this section and be specified in 9.5.8.3.

Move to
Eliminate this section in favor of 9.5.8.3
by JL, second by John M.
Vote, Result: 8,0,1 passed.

9.5.7.8 Out Band Spurious, closed
EdG: eliminate the text on Europe and Japan.

9.5.7.9 Modulation
JL: it shows closed
JimM: Editorial comments are in the papers.
EdG: the issue can be re-opened by paper submission and by a majority vote.
Jim M: Believe there are a couple of issues render discussion here.
MikeR: HS recommend a submission by Pulse Eng.
Jim M: We had a submission back in may
Jerry L has a submission

JimM: present his papers 111
concern about eye pattern bouncing with time.
proposed to specify an eye opening of no less than 140 kHz in the spirit of interpretability. also proposed a test pattern with 1010 patterns feeding the scrambler.
JL: have a paper pretty much agree with Jim M.
Jim shows the proposed change in the text.
EdG: this amounts to add a test specification here

Discussions on the implication of the TEST proposed here.

CJ: propose to finish the presentation of this paper, JL's paper, and John (Pulse Engineering) and then have the discussion.

JimM: concerned that a bad xmitting waveform may be adequately received by a compensating rcvr but present an unstable eye pattern to a good broad band rcvr which may prevent interpretability.

Discussion on JimM's proposed change to the text in 9.5.7.9 which is shown on the screen.

EdG: Tristate helps to state that the system should hold the xmitter on frequency during rampup and rampdown time.

JL: present paper on Transmitter Modulation

Eye closure, center frequency change, and zero crossing error.

Equipment you can buy can only measure eyes over 20 bits.

Propose Terms to be used:

minimum deviation > 140kHz

nominal center frequency <40kHz/msec

zero crossing accuracy < 1/8 of a symbol

Wayne Moyer has question on Zero Crossing Accuracy.

MikeR: 1/8 error on zero crossing is too large and like it to be tightened considerably.

JL: Measurement error of existing equipment is limited.

JimM: shows Intersymbol interference can smear the zero crossing quiet badly.

JohnTate: My number of frequency drift is 10kHz/100msec.

JL: We should not over specify and also it will be difficult to measure.

JimM: propose to limit discussion to 2 min per person.

JL: Motion 1: The following terms for specifying the modulation:

Minimum Deviation: Smallest frequency offset from the nominal center frequency measured at the mid symbol interval.

Nominal Center Frequency: This is the short term mean of the frequency deviation measured at the mid symbol deviation.

Zero Crossing Accuracy: Is the time between successive crossing of the nominal center frequency.

JohnM. 2nd

MikeR: A friendly amendment,...

Gene: Another friendly amendment. Change zero crossing to an average of signal....

CJ: call the question, no second

JimR: pass

JohnT: pass

JohnM: question on zero crossing accuracy definition. Motion to Table the motion till tomorrow. WyneM. 2nd. vote: passed

EdG: move to adjourn till 8:30am. 9.5.9.7 should also be considered.

passed.

JohnT: Question to JL, how to arrive at 140 kHz? my derivation is 150kHz.

Gene: comment on zero crossing. Seems to have defined bit-to-bit jitter in JerryL's paper which is very large jitter.

Tuesday Morning, August 30 1994

JimM: Propose to address the FRAME SIZE issue this afternoon. Two papers 226 and 112 will be presented.

Back to the Agenda
9.5.7.9 Modulation
Jerry L: reintroduce his motion. He proposes to base the spec on a snap shot measurement of the waveform. Which measures the clock frequency as well as the zero crossing time.

Motion1: The minimum deviation and zero crossing error shall be measured across a (16) bit sample at (four) points in a transmitted packet.
For each sample, the nominal symbol clock shall be recovered, based crossings of the nominal center frequency in the sample. For this test it is assumed the symbol rate is 1 Mb/sec.
The deviation for each symbol shall be measured at the mid symbol point. The mid symbol points are the mid point between recovered symbol clock transitions.
The zero crossing errors are the difference in time between the actual crossing of the nominal center frequency and the recovered symbol clock.

Discussions on terminology.
EdG: Use the HP modulation domain analyzer to conduct this measurement.
JL: This motion has taken the measurement, base on instrument such as the HP Modulation Domain Analyzer into consideration
JimR: Is this the place to define such details of testing.

Motion2: Using the above terms, the following numbers are proposed:
The minimum deviation is > 140 kHz
The Zero Crossing Error is < 1/8 Symbol
The Nominal Frequency center frequency shall change < 40 kHz/msec.

Discussions on the numbers proposed in Motion 2 by JL.

JimM proposes an alternative wording of the motion.
Nominal center frequency is the freq. during the last 8 bits before the unique word.
About the center freq. the absolute deviation throughout the packet shall be at least 110 kHz.

JimM: The 110kHz is taking into account of all ill effects to the eye diagram of a xmitting waveform.
JL: It will probably take 170kHz deviation to obtain this.
LarryZ: Can we use eye diagram to do all the measurements?
Yes
EdG: will other specs such as DC level control effect this motion?
JerryL: the answer is yes. But the numbers being proposed can be accommodated in this motion.
Discussion on test patterns. JohnM commented that this should be addressed later.

JohnM moves that
The absolute deviation throughout the packet shall be at least 110 kHz with respect to the center frequency during the last 8 bits before the unique word.
2nd by JimR
discussion: EdG: Why last 8 bits before the unique word?
JimM: A convenient place to measure.
JimR: It provides a measure of the center frequency drift over the entire packet.
LarryZ: Needs to define center frequency.
Many in the group have the same concern.
JohnM: Change the wording of the motion to:

MOTION:
"The absolute mid-symbol peak deviation throughout the packet shall be at least 110 kHz with respect to the center frequency during the last 8 bits before the unique word."

Discussions on the definition and the measurement of center frequency.
LarryZ: proposes to define the center frequency to be the average of the difference of the average of maximum and minimum deviations.
JL: call the question, JohnM: 2nd, passes.

Vote on motion: 10,1,1 passes.

Now the group address the issue of symmetry or zero crossing.

JL: moves that
Zero Crossing error shall be less than 1/8 of a symbol.
JohnM 2nd the motion.

Discussions on whether to include Intersymbol interference into this spec. If measured during preamble, the zero crossing jitter should be substantially smaller.
more discussions on measurement procedure.
MikeR: why 1/8 but not 1/16?
JL: the eye diagram as shown by JimM sums it up. (the intersymbol interference).
MikeR: I like to see tighter specs.

extensive discussions on the tightness of this spec.
JohnM
Wayne
LarryZ
JimM
JimR call the question, JohnM 2nd
vote: 7,4,2 passes
Vote on Motion: 8,4,1 failed to attain 75%

JimR: amend wording on the motion.
more discussion on the exact wording of the motion.

MOTION:
Zero Crossing error shall be less than +-1/8 of a symbol, per diagram.
This motion will include a picture by EdG.
Moved by CJ. 2nd by EdG.
Vote on Motion: 9,1,2 passes

EdG: How to define the Center Frequency?
JohnM: This is a measurement issue. Do we want to define it right now?

WayneM: concerned about definition.
EdG: needs JerryL to help to work on the text.

Now the group moves on to the next item of the agenda.
9.5.7.10 Channel Data Rate

Motion to change data rate to symbol rate in this paragraph.
Moved by LarryZ, 2nd

JimR: Like to make the wording simpler.
CJ: comment on wording.
JL: Move to delete the section 9.5.7.10
2nd by JohnM.
JL withdraw this motion.

JimR: a friendly amendment, replace the wording of the section 9.5.7.10 to
A compliant 802.11 FHSS PMD will be capable of transmitting and receiving at a nominal data rate of 1.0 Mbps.
The rest of the original paragraph is stricken.

Morning Coffee Break

10:30 am meeting resumes

9.5.7.11 Channel Switching/Settling Time
JimM presents paper 113. The paper addresses the issues of CCA attack time, CCA Decay, SIFS, and contention windows.
CCA Attack Time of 16 usec to achieve 90% probability as documented in the July Meeting. This Time includes Radio Delay Time (about 5usec) and Measurement Time.

CJ: The time resolved in the July meeting does not include Radio Delay Time. This does not allow enough time even to do antenna diversity.
JimM: One only require to conduct CCA on the transmit antenna according to the resolution adopted in the July Meeting.
Discussions on whether to conduct CCA on the transmit antenna only or on multiple antennas.
Discussions on whether the 16usec include the Radio Delay Time? JimM asserted that time is included in the 16 usec.

The case of random data. 16 usec should achieve 70% of probability. Again this time includes Radio Delay Time (RDt).

JimM: recommend to conduct the measurement without the RAMP (up). In the context of conformance test.
Discussions on the numbers of time and probability. The numbers used now have not been determined as yet.
JimR points out that the -85dBm signal level has been decided.

JimM discusses the case of CCA with Interference. I.e. Recovery from Interference. discussions on the scenarios of the radio comes up to listen in the middle of the packet for CCA.

JimM: back to the paper and addresses other timing issues.
CCA decay time. Many discussions on this CCA decay time.
SIFS time.
Contention Windows
EdG: commented on MAC delay which may be done in parallel with other timing considerations and therefore can be ignored.
JimM: propose a motion based on the paper 113
a: CCAt = RDt+MAt
b: CCA-1t = RDt +MDt
CCA-1t shall be the same as CCAt.
EdG: needs to know the longest runs of 0 and 1's in order to decide on this motion.
discussions on the time specify based on Length field or random data.

JimM: Motion1: If base on Length field, then the CCA-1t should be within T1+-1usec
Motion 2: If length field is not received, then the CCA-1t should be within T2+-Delta
CJ: two motions will convey information to MAC group. And then adjust our position based on MAC group reaction.

JohnM:
Motion1: Upon cessation of an 802.11 FH PHY compliant signal above [-xx] dBm, The PHY must signal channel clear with [ ]% probability within [ ] usec. The PHY shall not signal channel clear prior to the expected end of a packet after having decoded the length field.

EdG: Units which can receive the header should have timing within one symbol time. Other units which cannot receive the header, will take longer time to acquire CCA. The question is then how much time should be allotted in the contention window for this class of units.

Adjourned for Lunch

Tuesday Afternoon, August 30, 1994

JimM: proposes a newly worded motion relating to the paper 113.
1. Motion: Define CCAd (CCA decay) as the time from the end of the MPDU at the antenna of the receiving unit until the ch_busy returns to zero.

1a.Motion: CCAd shall be Ta +/- Tb, where Ta is nominal and Tb is the tolerance. If the length field has been received Ta is 6 usec and Tb is less than 1 usec. If the length field has not been received the unit must wait at least TBD usec. Ta is [30] usec. [] indicates TBD.

2.Motion: If the length field of a packet is received the ch_busy line shall remain high for the length of time predicted by the length field + CCAd.

3.Motion2 holds even if the signal is lost due to interference of signal fade.

4. If a packet fades or is subject to interference before the length field is ...

Extensive discussions on CCA decay time. Most of the discussion centers around the consequences of different times the station required to acquire CCA with the reception of the length field (synchronized) or not (synchronized).

JimM propose a straw poll to determine whether to defer this discussion to after presentation of Framing papers.
The group decide to continue this timing discussion. However, it will be a 2min limit to each speaker.

The discussion is now centered around JimM's timing diagram shown on the screen.
JimM: Normal Contention Window (Slot Time), CWt,nom=M2+R/Tt+TDt+CCAt+RPt
=3+10+1+16+8=38usec

and Maximum Contention Window (Slot Time), CWt,max=CWt,nom+CCA-1t,max-CCA-1t,min+2*prop delay+margin=30+10+2+margin=42+margin.

EdG: R/Tt may be too large.
JL: Move that
R/Tt at the antenna should be less than 10 usec.
CJ: The best approach to handle asynchronous station is to specify the timing tight for synchronous station and make asynchronous station wait till it hear a length field (may be in the next frame).
JohnM: speak against CJ's comment.
MikeR: speak against CJ's comment.
EdG:
JimR: Speak for lengthening the contention window to the worst case.
JohnM: speak for setting the contention window to the synchronous case.
MikeR: Nothing wrong to allow collision which in the contention protocol, one cannot eliminate it.
EdG: Agree with JimM's proposal and may be some room to fine tune the number.
CCA to 25 usec as slot time.
JimM: Slot time is MAC issue. We provide input to MAC.
JL: Let's first Define time from the end of MPDU to sending a ACK which does not require CCA.
EdG: Move to set the Slot time to 50 usec.
(to allow some room for CCA)
MikeR 2nd.
Discussion on the motion:
JohnM:
JimM: Should PHY only specify the contention window or including other times.

EdG: move to
Set Contention Window to 50 usec based on the following:
R/Tt as defined in 94/113 < 10 usec
Xmit Delay, TDt < 1 usec
Ramp Allocation = 8 usec
CCAt = 31 usec
MAC delay, M2 = 0 usec

(no allocation for CCAt to prop delay or margin)
JimR 2nd.
JL: the 50usec should be define at Ether (antenna).
The Motion Tabled till individual time specs are resolved.

After Break

Motion:

Set Time from MAC command to start a transmission of the first bit of 1,0 preamble is 20 usec, Maximum.
based on the following
R/Tt as defined in 94/113 < 10 usec
Xmit Delay, TDt < 1 usec
Ramp Allocation = 8 usec
MAC State Machine delay < 1 usec
moved by JimM, 2nd by JL

Vote: 9,1,2 passed

Motion:
Relative to CCA motion of July 1994 the TBD time is 30 usec rather than 16 usec.
Moved by JimR, 2nd by EdG.

Discussions:
JimM: The time specified is too long.
JimR: Clarify that 30 usec includes 6 usec of delay and 24 usec of detection.
JL: Is it specified at the antenna?
JimR: It is the intend.
EdG: Speaks for the 30 usec as proposed.
JimM: Thinks 8 usec is adequate to perform CCA.
More discussions.
RayM: present simulation results on the probability of CCA based on paper submitted by Dean. The time specified does not include delay.

	Prob. of Det preamble	Prob of Det random data	Prob. false alarm
10 usec	96-99%	63-85	5-12
20 usec	97-99	85-91	2-4
40 usec	>99	97-99	<0.02

EdG: call the question. CJ second.
Vote: 6,2,2 question called
Vote on Motion: 3,4,3 motion failed.

JimR: Straw poll on the proper time to specify, in this case excluding system delay.

JimM: Straw poll on determine to specify the same time for Both or one time for Preamble only.
Both 2
Separate Time for Preamble and Random Data 4
Other 1

Straw poll for Preamble only
0-10 3

10-20 4
20-30 1

10-15 6
15-20 2

10 4
12 0
15 3

Motion: relative to CCA motion of July 1994 the TBD time is 16 usec based on 6 usec receiver delay and 10 usec measurement period.
by JimM, JL 2nd
Vote: 4,3,2, the motion failed.

EdG moves to table until Wednesday AM.
no second.

JimR moves to meet tonight at 7:30pm until 9:30.
JohnM 2nd.
JohnM called the question, JL 2nd,
the question is called.
Vote on Motion: 6,1,1, motion passes.

EdG: move to table the motion till 7:30pm.
JohnM 2nd.
The motion passes.

The group agrees to discuss the Channel Switching and Settling Time
9.5.7.11 Channel Switching/Settling Time

Straw poll on the Channel Switching Time
300 usec 3
150 usec 5
80 usec 1

Motion: TBD microsecond in 9.5.7.11 of 94/068r3 is 150 usec.
Moved by JimM, 2nd JohnM.

Discussions in attempting to come to a compromise.

JimR: The frequency should be settled to 25ppm.
JimM: One would need tolerance for manufacturing. We may need tighter spec here.
JimR: The 25ppm should include allowance of other tolerances.

JerryL: feels safe at 250usec. but extremely nervous at 150 usec.

JohnM: move to adjourn.
LarryZ Z 2nd. passed.

5:05pm.

Tuesday Evening, 7:40pm, 8/30/94

JimM: propose to reword the motion to include tolerance since one can not decide one without knowing the other.

New Motion:
TBD microsecond in 9.5.7.11 of 94/068r3 is 224 usec. The frequency accuracy TBD kHz is changed to 60 kHz.
Moved by JimM, 2nd by JohnM

Vote on Motion: 6,1,0 the motion passed.

JimM: The compliance test issue will be resolved later.

9.5.7.15 VSWR

Move to delete this spec.
by JL, 2nd by EdG
Vote: on Motion: 8,0,0 the motion passes

JimM: Straw Poll on the following topics to discuss this evening

CCA/Timing	2
Transmit Specs	1
9.5.8.1	
9.5.8.2	
9.5.8.3	
Frame Length	1

The result of the poll brings the group to the topic of CCA/Timing.
The original Motion failed to pass this afternoon states:
Motion: relative to CCA motion of July 1994 the TBD time is 16 usec based on 6 usec receiver delay and 10 usec measurement period.

Discussions:
EdG: Reemphasize that the importance of using CCA to avoid possible collisions.

JimR, JohnM, and CJ spoke against EdG's desired to increase CCA time.
Some discussions on the distinction between the CCA reaction time and the CCA Observation time.

The wording of the motion has been changed to the following after a length discussion.

> Motion:
> Slot Time is 50 usec.
> The interval from the MAC command to transmit to the appearance of the first bit of the preamble at the RF antenna (also called collision time) is a maximum of 20 usec. The channel shall be assessed for at least 30 usec. The interval from the start of the preamble at the antenna to the time when the ch_busy line goes high is a maximum of 16 usec.
> Moved by JimM, 2nd by EdG
> JohnM calls the question, JL second
> Vote: 8,0,0 the question is called
> Vote on motion: 8,0,1 the motion passes.

JohnM: move to adjourn. EdG 2nd.
The meeting is adjourned at 9:30pm till 8:00am Wednesday.

Wednesday Morning 8:15am, 8/31/94

The group starts the day on the topic of Frame Length (or Block Length).

Ray Martino presents the paper 226 he co-authored with Dean Kawaguchi.

The group discusses on pros and cons of short and long frame length (stuff bit).
Longer frame length may have patterns which cause more severe droop and overshoot in the discriminator curve. However, the probability of these patterns to occur is minute.
The choice between the longer frame length versus shorter frame length seems to boil down to whether longer frame length can cause some packets not to be delivered to their destinations because of the distortion. There are proponents in the group to use different scrambling polynomial to further minimize the probability of packets with long run-length pattern from occurring.

JimM presents his paper, 94/112, on Frame Length.

MikeR: DC level should not be a problem. It is known to be solvable without using scrambling or run length control.
RayM: AC coupling is a common solution which exists out there. The group should provide a vehicle to allow it.

Discussions on the differences of results presented in the two papers.

CJ: In JimM presentation, the simulation stresses the cutoff of high pass filter. In Ray's presentation, his data pattern stresses both the cutoff of highpass and the lowpass (or channel select bandpass) filters.
Some concerns have been expressed on the magnified probability of error as the data transition from long strings of 1's (or 0's) to a balanced random pattern.

> Motion: Frame length of the 94/69 proposal is 32.
> by JimM, second by Stuart

Discussion:
JimR: Concerns about the length field which MAC counts on to find the MAC frame length.
MikeR: Uncomfortable about the presentation didn't include the important packet error rate. Also uncomfortable about the way the decision is compromised. Recommend to wait till next meeting to decide.
CJ: propose to test with pseudorandom data. Which will reveal some conditions of worst data patterns.

> JohnM: call to question
> JimR 2nd
> Vote: 5,2,1 question is called
> Vote on Motion: 4,2,3 motion failed to reach 75%.

Adjourn for Coffee.

10:30am meeting resumes

EdG: Reopen the earlier motion

> Motion: Frame Length of 94/69 proposal is 32 bits
> by EdG, 2nd Stuart
> Vote on Motion: 5,1,1 motion passes.

JimM: The group now join the Full PHY meeting. This afternoon, at MAC/PHY meeting, we will raise the issue of HOP TIME and whether PHY or MAC should determine it.
EdG: MAC seems not definitive about this issue.
JimR: The first question should be whether there will be one hop rate or more than one.
EdG: Different hop rate may cause some problems in terms of channel isolation.
JimR: The different hop rate may be assigned on ESS or BSS bases. The mutual interference probability will remain the same statistically.

EdG: start discussion on the bit ordering of the PLCP field.

Thursday Morning 8:20 am, September 1, 1994

JimM: Topics to cover today.
- CCAt
- SIFS
- Power Control
- FH Report
- Transmit Specs
- CCAt Threshold

EdG: Proposes to work on Power Control and Xmit Spec's
JohnM: Proposes to work on CCAt Threshold.

JimM: Goes over his paper on Power Control, 114.

EdG: Propose to delete the text.
JimR: Feels the group should allow the xmit power to be flexible with a upper limit of 1 W.

The group discusses the topic of CCA threshold and work to arrive at a proper wording of the Motion.

> Motion: Define CCA Threshold as a function of the intended RF power level.
> CCA Threshold = -65 dBm - Transmit Power in dBm.
>
> by LarryZ, 2nd by JimR
> JL call the question
> the question is called.
> Vote on Motion: 4,0,4 the motion passes.

Next topic, power level.

EdG: it should be 4 level.
JimR: feels that the power level should not be specified other than the 1 W limit given by the FCC.
EdG: Should we eliminate the wording on power level specs for Europe and Japan?
JimM: The group has decided to delete those texts throughout the document.

LarryZ: Like to see more levels.
JohnM: Maybe a labeling to the compliant product may indicate the product's capabilities, may include power level in the label.

JohnM moves that

> The 802.11 compliant frequency hopping transceivers shall be labeled in three classes according to their maximum EIRP

Class 1 up to 30 mW
Class a up to 100 mW
Class 2 up to 300 mW
Class 3 up to 1 W.

Members in the group express concerns about the specific power levels defined by the 2-bit power level field in the protocol.
MikeR: speaks for defining the level to be defined.
JimR speaks for not defining the specific levels.
Wayne: Speaks in support of labeling into classes. Sympathetic about MikeR's position which can allow MAC to have some form of power adaptation.
CJ: supports labeling. Also feels that the power levels should be set. Sees a serious hidden node problem arises if a network is composed of stations with different power levels.
JimM: speaks against defining specific power levels.
MikeR: advocates to include antenna gain into the power consideration.

JL: propose a change in the motion text
The 802.11 compliant frequency hopping transmitters shall be labeled in four classes according to their maximum nominal EIRP
Class 1 up to 10 mW
Class 2 up to 100 mW
Class 3 up to 500 mW
Class 4 up to 1 W.
2nd by Wayne Moyers

CJ: It can cause some confusion between class2 and class3
Stuart: Call the question, Wayne 2nd
Vote: 9,0,0 the question is called.

Vote on Motion: 7,2,2 the motion passes.

EdG: Now we have four classes of power levels. Whether still need the four level power control exchange between PHY and MAC?

JL: This does not preclude adaptive power control.

JimR: move that .
Motion: Delete 9.5.8.2
JL 2nd.

JimR: This does not preclude power control.
CJ: The classification does not guarantee the power will be the same which can cause severe hidden node problem.
LJ: call the question,

question is called.
Vote on Motion: 5,4,1 the motion fails.

WayneM: the last word in the text of 9.5.8.2 should be 1000mW rather than 100mW.
Motion:
Change last word in 9.5.8.2 to 1000mW.
CJ 2nd.
Vote on Motion: 7,0,3 the motion passes.

EdG: Move to
Table the xmit power level control and move to spectrum shape.
2nd by WayneM.
Vote on Motion: 6,0,1 the motion passes.

9.5.8.3 Xmit Spectrum Shape

JL: can be measured easily with appropriate HP test equipment.
Remove the frequency reference to -20dBc
Measure with 100 kHz resolution
Power to be calculated by integrating over 1 MHz comparing to the xmit power.

Motion:

JimM presents his paper 220 while JL preparing text for his motion.

MikeR: Concerns about the severity of the spec that most commercial available technologies can support this spec?
JL: suggest not to distinguish static and dynamic splatter. Afraid below 3MHz delta the dynamic spec is too stringent.

JL:
Motion:
The transmit spectrum mask shall be measured under dynamic conditions.
The power generated in a 1 MHz Channel, for a given carrier offset shall be less than the values in the table below:

Channel Offset (MHz)	Specification Limit (dBc)
+/- 2	-40
>=+/-3	-60

moved by JL, JimR 2nd.

MikeR: Dynamic condition is not defined.
JohnM: The test should be defined later as the committee works on the conformance test later on.

JL: The intention is not to ignore test issues but to make progress.
Wayne: Propose some wording change.

Motion:
The transmit spectrum mask shall be measured under dynamic conditions such that the power generated in a 1 MHz Channel, for a given carrier offset, shall be less than the values in the table below:

Channel Offset (MHz)	Specification Limit (dBc)
+/- 2	-40
>= +/-3	-60

moved by JL, JimR 2nd.

MikeR: Based on my experience in 802.3, if the parameter is not in the standard, it will not be included in the conformance test. Propose to add 2 numbers. the dynamic condition is 1 msec on and 1 msec off.

JL: Modify the motion to

Motion:
The transmit spectrum mask shall be measured under dynamic conditions such that the power generated in a 1 MHz Channel, for a given carrier offset, shall be less than the values in the table below:

Channel Offset (MHz)	Specification Limit (dBc)
+/- 2	-40
>= +/-3	-60

The radio shall be set to alternatively xmit and rcv with nominal duty cycle ratio of 1 to 1. And the xmit packet length shall be greater than 300 usec and less than 2 msec.
moved by JL, JimR 2nd.

Vote on Motion: 10,0,2 the motion passes.

JohnM: Move to adjourn.

EdG: Is 9.5.8.4 Ok.

JohnM:

Motion: Delete the table and replace the last sentence to
It shall maintain this stability over the stated operating temperature range.
2nd by CJ
Vote on motion: 10,0,0 the motion passes.

the FH PHY is adjourned.