PHY Subgroup Unapproved Minutes - San Diego Meeting 11/9/92-11/12/92

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In the absence of anyone willing to take formal minutes the group agreed to allow copise of the overheads generated during the meeting to be used as minutes. The following represents a transcription with some editorial of those overheads.

Tuesday PM

An agenda was established that showed the three presentations being review on Wednesday morning after the break, Tuesday afternoon spent in hashing out channel modeling ideas, Wednesday afternoon agreeing on a channel modeling methodology and Thursday morning open for whatever seems appropriate at that time.

Tuesday afternoon discussion centered around questions concerning whether or not antennae should be considered as medium and whether our channel model should considered "engineered" mediums such as reduced delay spread mediums that might be achieved by the use of directional antennae or modifying the environment to provide a preferred location. Other topics discussed where how these systems could be conformance tested and what the role of the model in conformance testing is. A weak consensus was reached that initial modeling should assume a "reasonably" worse case scenario with respect to the medium modeled, but this was consensus was much to weak to be considered final.

Wednesday AM

Papers 92/130, 92/127, and 92/133 were presented.

Wednesday PM

After much discussion regarding modeling the following conclusions were reached.

We are building models for the following reasons:

1) Assist in the creation of conformant radios
2) Assist in the evaluation of modulation and coding proposals
3) Assist in the evaluation of MAC protocols proposals
4) Assist in the generation of conformance tests

As an immeadiate starting point we will adopt as a temporary model a model based on GWSSUS assumptions and will use the Attenuation and RMS Delay Spread numbers presented by Jonathan Cheah as starting points for our work.

These are:

Heavy industry: Standard Deviation 4-7 dB, n=3.3-4.2 RMS Delay Spread 80-140 ns

Retail Environment: Standard Deviation 5-10 dB , n=1.8-2.4 and RMS Delay spread 100-140 ns

Office Environment: Standard Deviation 2-7 dB, n=3.3-4.0, RMS Delay Spread <50 ns

It is agreed that this is an inadequate model to meet the needs listed above and that with the next interation the following guiding principles will apply:

1) The initial model will not be concerned with directionality, although it may provide hooks to add dimensionality later.

2) The initial model will offer interference profiles that can be either included or separated out.

3) The initial model will have multipath included

4) The initial model will have magnitude an phase information making the impulse responses complex.

5) The initial model will take into account variability with position

6) The initial model will take into account variability with time

7) The initial model will be for the 2.4-2.483 MHz ISM Band

8) The initial model will be based on some refernce anntennae chosen by the channel characterization group.

Thursday AM

A motion was made:

To adopt Document 92/127 as the PHY Group Working Draft of the IEEE 802.11 2.4 GHz ISM Band FH PHY Standard.

Moved by: Mike Rothenberg Second: Nathan Silberman

It was agreed that a note would be added to the minutes that:

The group intends both the numbers and the structure ofthis draft to be open to modification.

Motion passed unanimously: 16 For 0 Against 0 Abstain

Next the discussion moved onto the subject of what must be changed in the document prior to it being ready for ballotting.

Jan Boer(JB): Items 9-24-25 are similar and should be combined. The hop times should be faster if we are to take advantage of frequency diversity aspects of FH SS. 10 ms per hop seems more reasonable as a minimum.

Larry VDJ(LVDJ):What we will do is let the discussion free run and identify what groups we should break into after coffee break to address items in detail.

Colin Lanzl(CL): Items for item 9-24-25 should be at the minimum level arequired by regulation.

Mike Rothenberg(MR): In establishing hop time we should look at packet size limits.

Mike Pettus(MP): Is it necessary to have a constant hop time? Perhaps we should have data rate dependent hop times. For efficency reasons it may be useful for these to be dynamic.

Bob Buass(BB): Hop Rate should be dynamic and negotiated. The establishment of a hop rate should be mindful of the microwave oven interference repetition rate.

Don Johnson(DJ): Why do we need a falback data rate and why is the rate listed in item 18 so low?

BB: Possible to allow the use of FEC and other techniques that enhance BER.

John McKown(JM): How can things be negotiated and still maintain interoperability? Do you have some set and let somebody pick what to use?

BB: If there is negotiations then you need to go to the lowest common denominator at some time in order to allow stations to gain access. We need to provide a higher layer with a steering wheel.

BB: We need to consider whether we must fit a packet in before we hop, whether we hop within a packet. We need to also consider dead time between hops. We owe the MAC people some information regarding how they must deliver packets if this is constrained by hop time.

Nathan Silberman(NS): Perhaps we will need to buffer the packets.

John Christensen(JC):Should we really limt the number of hops to 75 or shouldn't we go higher?

DJ: We can't do too many more if we only have 83 MHz

MR: We need to consider other modulations and coding including 4 or 8 level DPSK, 8 level FSK, TCM, and other issues such as using Reed Solomon codes or convolutional codes. Whether there should be interleaving and/or frequency diversity. But will the FCC permit it?

BB: The FCC is open to good proposals that meet the spirit of 15.247. We should evaluate proposal in light of a bigger scope than strictly that detailed in 15.247

CL: Item 30 might be too agressive. How would the MAC feel about BERs of 1 * 10^-6.

MR: 1* 10^-6 might not be good enough

BB: 1 * 10^-6 might not be good enough to let the CRC bring up the detected error rate.

LVDJ: it is time for break. It looks like there could be four discussion groups after break. These are:
1) the item 9-24-25 discussion group.
2) the Acquisition and Synchronization group
3) the what parameters are relevant to interoperability group
4) the modulation and coding group

CL volunteers to give NS information for items 9-24-25 off line and people volunteer for groups 2 and 4 above. After Break these discussions take place.

Acquisition and Sync Subgroup Meeting Notes:

Pinhas Romik(PR):speaks for a fixed hop rate becasue acquistion is difficult or impossible otherwise

JC: Points out that a call-in channel might be possible

Wayne Moyers(WM): In dense use situation there could be confusion when one networks meet-me channel interfereds with another networks meet-me channel. The PHY layer filters out other networks because the MAC might be a DSP chip. It is essential to be able to power down the MAC.

PR: What about the single hopping rate and a control channel a variable hopping rate might be good for efficency and be left for proprietary differntiation.

Much discussion on the use of a control channel from which other levels of service can be negotiated.

Coding Subgroup Meeting Notes:

Modulation:

Related to delay spread, define symbol rate range

What is the objective of modulation selection-criteria

BER through channel including interference
- conforming systems, similar systems
- Microwave ovens
- dissimilar system interference (non-conforming)
- thermal noise
- ISM devices

Propogation
- Look at GWSSUS model data
- Use Jonathans numbers as a basis
- Add fading statistics for LOS path
- Show how it changes with direction of arrival (Rayleigh)
- Ignore Statistics of remaining paths

Economic Feasibility

What is the channel bandwidth

CPFSK is better for FH than any other modulation method
- Minimum distance between constellation points is known
- 0.6125 Msybols/sec has a period of 1.6 microseconds
- 200 nsec absolute delay spread means no brainer for multipath

8DPSK
- 0.750 Msymbols/second has a period 1.4 microseconds
- also no brainer for multipath

What Eb/No value will give required BER

2.5-5 dB coding gain seems practical

16DPSK at 0.750 Msymbols/sec with 1.4 microsecond period.

Noon: LVDJ it is time to break. Should we continue the groups at the next meeting. Yes. At the next meeting we will continue FH groups, accept input from channel, DS, IR groups. We hope to have at least 1 initial channel model to work with by then. JM states that the California Microwave bulletin board will be a hotbed of channel modeling activity in the interim period. LVDJ requested that people review Document 92/4 and 91/23 as background to our current efforts. Meeting adjourned.