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**IEEE P802.11  
Wireless LANs**

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**Tentative TGa minutes**

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**Abstract**

This submission is the tentative minutes of the TGa 5GHz working group.

**Monday, 14 September 1998**

Meeting of 802.11 Task Group A (5 GHz Study Group) called to order at 11:00 AM by Chairman Naftali Chayat

The secretary for the meeting will be Mike Trompower

Naftali provides short overview of 802.11 5GHz

**Set Agenda:**

- approval of Minutes from July Meeting
- create list of current submissions
- review current status of TGA
- review of draft text submission
- refine details of the modulation
- set agenda for November Meeting

- since there is not a quorum present at this meeting, all motions and decisions will be ratified via a letter ballot.

**Motion 1 (approved by consensus):**

motion to approve agenda as established above

no motion to approve minutes of July meeting task group A since no quorum present

**Submissions:**

- 305 - (Masahiro) MMAC report (doc 312 is presentation)
- 306 - (Naftali) BRAN report
- 307 - (BreezeCom) Addressing BRAN issues
- 308 - Preamble improvements
- 318 - (Hitoshi) Draft v1.1 presentation and editorial changes

Naftali gives the current status of TGA which reviewed the assignments of liaison with BRAN and MMAC and the formulation of a letter (98/281r2) to be submitted to Industry Canada

Report of MMAC liaison by Masahiro Morikura (documents 305 and 312)

MMAC = Multimedia Mobile Access Communication Systems Promotion Council (established 1996)

MMAC would like to recommend that IEEE802.11A modulation be used and not create a competing standard, however, there may be some channelization differences

**Report of BRAN letter / liaison by Naftali (document 306 and 309)**

ETSI BRAN has selected OFDM as modulation but has not selected primary operating parameters, there will be much effort to select a common modulation. As such, BRAN requests that TGA postpone the selection of major parameters until January meeting which can be a joint meeting between BRAN and TGA. Naftali comments that it is now premature to make this decision and will defer until later in the week. Naftali presents several technical challenges which might require some parameter changes.

There are some logistics issues with cooperating with BRAN. Their meeting is October, our next meeting is November, joint meeting in January. There are time lags inherent with the voting processes of both committees.

adjourn at 12:00 , reconvene at 1PM on Tuesday

**Tuesday, 9/15/98**

meeting called to order at 1pm By Naftali

Begin with presentation of document # by Hitoshi. Describes the changes made to the 5GHz draft text since last review. Several additional items are brought up and some corrections are made in "real-time". There are some remaining issues, which will be addressed in a smaller group and presented at a later time.

Naftali passes the chair to Masahiro and presents doc#307 concerning the ETSI BRAN liaison meeting.  
Naftali recommends 9 channels with 20MHz band edge spacing

**Motion 2(Naftali/Masahiro):**

Move that TGA change the channel spacing from 15 MHz to 20MHz.

Discussion - Hitoshi states that much simulation has been done with 15 MHz and that information is needed to determine if adjacent channel issues are created by increasing the spacing. Naftali says that his understanding is that adjacent channel interference would be about the same.

Hitoshi feels that it is too early to make this decision until there is more discussion and study.

Richard VanNee states that there will be an additional advantage in that the sampling rate can be made same as spacing. He speaks neither in favor or disfavor of the motion. The data rate will be 32Mbps as long as the guard time remains 800ns

Much discussion on whether or not we should not specify parameters or whether the committee should wait for BRAN to make their modulation selection

**Motion withdrawn** by the mover and seconder without any objection from the committee

The remainder of the paper is presented with several points made about possible parameter selections to be recommended at a later time

Chair returned to Naftali

Hitoshi provides quick presentation with the conclusion that channel spacing is an important parameter to be considered. This document does not yet have a submission number.

Naftali gives call to see if there are any new submissions to be given so that time may be allocated.  
None announced

continuing with the agenda

Presentation of Doc #308 Tal Kaitz by (Breezecom) concerning preamble improvement

Naftali starts a discussion on the regulatory and interference issues pertaining to satellite operation in the ETSI 5 GHz band.

Meeting adjourned at 4:30

meeting reconvene at 4:30 PM on Wed 16 Sep

Naftali summarizes the stopping point and indicates that there was an "off-line" meeting with several members of TGa. He will provide details and outcomes of that meeting.

Summary of document #329A concerning channel spacing. The document shows results of a decision to consider a channel spacing of 18MHz (instead of 20MHz) ... sampling rate can remain at 20MHz and number of subcarriers can remain at 48. The biggest benefit is that we obtain a 23 MHz band edge buffer (using 4 channels in 100MHz)

He then summarizes a frequency plan, which was agreed to by the subgroup.

Data rates will be 6,12,18,24 and 36 Mbps

Subcarrier spacing - studied using a 128pt FFT but settled on using 64 pt FFT for several reasons (see paper).

This decision requires a higher guard interval

A decision on oscillator accuracy was also reached

They also decided to recommend an optional 64QAM mode, which allows 48 and 54Mbps rates

These parameters will be passed to BRAN for their consideration

**MOTION 3 (Richard VanNee / George Fishel)**

Move that the parameters presented in doc #329A be incorporated in the draft text and be passed to BRAN for consideration.

Discussion - oscillator specification being used for separate RX and TX operation and sampling operations concern whether or not a specific design is being or should be specified

**Motion passes ( 10/0/2 )**

Next a discussion of the use of spectral mask versus time windowing specification - which would be more appropriate to provide a better specification.  
Carl Andren points out that a spectral mask approach would also require a constellation accuracy specification

**Motion 4 (Richard Van Nee / Vic Hayes)**

Move to replace the time windowing specifications with appropriate spectral mask and constellation accuracy specifications.

**Motion passes ( 8/0/1 )**

There will be a small task force formed for the purpose of defining these parameters necessary to fulfil this motion. The first meeting will be immediately following the closure of this TGa meeting

Hitoshi gives a short informational about the current state of the draft text

Naftali summarizes the current state of the letter to Industry Canada

meeting adjourned at 5:30

reconvene at 8:30AM on Thursday 17Sep

Naftali begins by summarizing the results of the evening group to choose a spectral mask and constellation accuracy

The group decided that the spectral mask is necessary but that a specification on constellation accuracy should not be a part of the standard since there are many arguable items within the scope of the test setups and transmitter designs. As a result, the group agreed to base the test upon receiver sensitivity specifications.

**Motion 5 (Richard Van Nee / Masahiro)**

Move to amend the TGa draft text to state that there will be no modulation accuracy specifications other than sensitivity (in AWGN) requirements.

Discussion - Carl Andren states that there are valid reasons for specifying modulation accuracy and expresses his hesitancy about leaving these specification out of the text. But because he cannot suggest a better approach he will not do other than express his concern

Dean Kawaguchi expresses concern that there may some equipment which may be produced which will put an undue stress on interoperable equipment attempting to receive. He points to an example of a particular vendor which might implement an equalizer in his receiver such that he can receive his own signal, however, another vendor who did not implement an equalizer will not be able to receive the signal. Who is at fault for the non interoperable products unless there is a modulation accuracy specification?

Dean further states that (in regards to a fully specified test and specs) two companies can perform their own modulation accuracy tests on each others equipment to determine who's equipment is deficient.

Naftali - general impression of the group is that the modulation accuracy specification should be made part of the standard.

**Motion fails ( 0/7/8 )**

As a result, the motion #4 is still overriding which requires the group to produce a modulation constellation accuracy specification.

current preamble looks like the following:

6 short sequences, 2\*(guard + long sequence), 3 short sequences, 2 QPSK modulated short sequences

there is a proposal to change it to :

6 short sequence, guard interval + 3\*(long sequence), 2 QPSK modulated short sequences

$6*16+16+3*364+2*16=336\text{pts}=16.8\text{microseconds}$

The reason for the change is that the implementations can be made simpler if not having to perform phase estimation on the short sequences.

Naftali reports that some testing has been done with the new sequence and that there is high confidence that there will be ample improvement by making this change.

He also says that there is some concern that the first 6 short sequences may not be enough time to perform all the necessary analysis to recover the signal. He says that there is some leeway to add additional short sequences at a later time.

Richard suggests another modification, which would allow the two QPSK sequences to convey length information. He suggests that there be at least one OFDM symbol be used.

48 bits (using BPSK for robustness) gives 24 bits (using rate 1/2 code) with 6 'wasted' tail bits to terminate the trellis of the convolutional coder gives 18 bits which would be sufficient to convey length

Naftali says that this symbol should not be scrambled so that there will not be additional bits lost due to scrambler initialization and he recommends that a prescribed scrambler be named

Mike Trompower points out that 802.11 specifies a maximum frame length of 2400 bytes, therefore much less than 17 bits will be needed to convey length (15 bits are needed to convey maximum length using 1bit/symbol)

Naftali makes the following proposal:

2 bits uses to select 1 out 4 "cover sequence" used for scrambling

5 bits to convey rate information

11 bits used for duration in OFDM frame units

6 bits for trellis termination

total 24 bits

This results in a total preamble length of 19.2 microseconds

Naftali proposes using 7 short sequences, which gives a margin and allows for "nice" 400 point 20 microsecond preamble.

### **Motion 6 (Richard Van Nee / Kazuhiro)**

Move to accept the following new 20 microsecond preamble:

7 short sequence, guard interval + 3\*(long sequence), 1 OFDM symbol:

where the OFDM symbol consists of guard interval + 64point header frame

(with same interleaving as with BPSK) with the bit definition according to:

(2 bits uses to select 1 out 4 "cover sequence" used for scrambling, 5 bits to convey rate information, 11 bits used for duration in OFDM frame units, 6 zero bits for trellis termination).

### **Motion fails ( 4/2/12 )**

George Fishel requests input regarding what he should do as liaison with ITU-R.

Don Johnson summarizes some of his activities and suggests that we ask for the full power allowed by the middle band.

George invites interested parties to participate in the editing of a letter to ITU-R.

meeting adjourned at 11:00

## TGa minutes - Friday, 9/18/1998

Carl Andren

### Agenda:

Accuracy specs  
 Preamble  
 Regulatory update  
 BRAN cooperation and schedule  
 July minutes approval  
 IBM e-mail discussion  
 Goal setting

Accuracy Specification discussion. Transmission modulation accuracy is difficult to measure, but necessary for a complete spec.

Naftali: Proposed test described: Down convert to low IF, digitize and digitally process in several steps.

Keith: why is there a test specified rather than just the specification

Naftali: because it is a difficult test and needs to be specified.

Wes suggested "or an equivalent procedure" should be added.

Naftali: a lot of details are left out, but everybody should follow the basic scheme.

Specifications Added:

1. TX center frequency leakage. -15 dB/overall power
2. TX spectral flatness. +/- 2 dB from average energy , -4 dB on band edges
3. Transmitter constellation error, data rate dependent

### **Motion #7 (Hitoshi/Richard Nee):**

Approve the text changes for Modulation Accuracy 1.3.7.5. specifications

### **8-0-5 motion carries**

Naftali: Changes to paragraph 1.3.6.6 Modulation

1. changing table into I and Q descriptions for simplification
2. other editorial changes
3. normalized energy of the pilots

Motion #8: Approve the text changes for the Modulation specifications

Hitoshi/Masahiro 6-0-3 motion carries

Naftali: Change to recommend having symbol and carrier reference not locked together.

Naftali: this allows an implementation that has a remote TX up/down converter.

### **Motion #9 (Masahiro/Hitoshi):**

Remove second sentence of paragraph 1.3.7.4

### **6-0-4 motion carries**

Naftali: preamble structure needs changing.

Hitoshi asks the group to bring ideas in a month

Naftali asks consideration of Tal Kaitz's paper on changes that give 20% improvement.

Hitoshi, Richard, we need time to study it.

### **Motion #10 (Richard/Hitoshi) :**

Accept the change in the preamble related to concatenating the two repetitions of the long sequence without guard interval between them and using a single increased guard interval in front of both as described in paper 98/308 by Tal Kaitz

### **4-0-8 motion carries**

No update on regulatory available.

approval of July minutes:

**Motion #11 (Hitoshi/Masahiro):**

approve minutes

**10-0-3 carries**

IBM e-mail

Naftali: They want to show group the advantages of a new technique that is far superior to OFDM. Naftali asked them to provide details. We will not change unless there are compelling reasons.

Do we want formal action related to this suggestion?

Bob O. Let them come and present.

Stewart: Make sure the minutes reflect what we said here.

Anil: Let them come and if we want it, someone will make a motion.

John: let them send something out on the reflector and then present it at a meeting.

Greg/Vic: We have to somewhat hard nosed. Let group decide on time allocation. Vic will put it on reflector

Keith: Give them advance notice of how much time they will have to present. Naftali will tell them how much they will get.

Carl: speculates that the technique is complex

Hitoshi: We should not reopen the issue.

Stewart: We should give them the benefit of the doubt.

Vic: we would need a motion to reconsider.

BRAN interaction

Naftali: We will send to BRAN some recommended parameter changes such as

1. channel spacing.
2. OFDM parameters
3. constellations
4. coding method
5. oscillator accuracy

What is a common PHY? We need to instruct the task force on these issues.

What is acceptable in terms of schedule. BRAN wants us to hold the draft status to keep it flexible.

Keith: we might not be ready in Nov to send it out for ballot, so let's not delay our process. While cooperation is important, we need to start the ballot process when we are ready. We can handle their input in the comment resolution process.

Discussion on the process of getting to letter ballot / sponsor ballot.

Schedule:

LB1 in Nov

Comment resolution and BRAN/ETSI cooperation in Jan

LB2 in Jan?

Keith: will we finish comment resolution in Jan? Expect 1000 comments on LB1.

Vic: The 802.3 group has the editors suggest resolution before meeting.

CB1 if we get to 75%

SB1 in Mar or May 99

SB2 in May or July 99

July/Sept Sponsor Reconfirm ballot

Sept/Nov 99 RevCom

Dec Stds Brd mtg., Submission in Oct.

Regulatory issues presentation by George Fishel. Wordsmithing of a letter to ITU-R

Adjourn at 12:10.