

Tentative Minutes of the IEEE P802.11

**Full Working Group
Interim Meeting
Lynnwood, WA**

19 to 23 January 1998

Monday, 19 January 1998

1.0 Opening Meeting called to order by Vic Hayes at 08:30, Agenda of 44th session of 802.11 is in doc. :IEEE P802.11 11-97/158. Al Petrick acting as secretary for George Fishel ¹⁾ is present and ready to take the notes.

Objectives for this meeting, all groups

Review the LB result on the 802.11 (maintenance) PAR
Review the LB result on the 802.11c (bridge) PAR
Work on detailed proposals for TGa and TGb
Full detailed text required on accepted proposals
Refinement of the evaluation criteria

1.1 Roll Call: People in the room were invited to introduce themselves.

1.2 Voting rights:

1.2.1 Participation in debates, moving and seconding is only permitted by voting members, in all 802.11 meetings (at all levels). The subgroup chairs may permit observers to participate in debates.

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1.2.2 Voting at the working group level is by voting members only. Chair may permit observers to participate in debate. To become a voting member:

1.2.2.1 participate in at least 2 out of 4 consecutive plenary meetings. Voting rights start at third meeting

1.2.2.2 participation in at least 75% in meetings, in the room

- one interim may be exchanged for a plenary
- Voting members will get a token to be used at votes

1.2.3 Voting rights can be maintained:

1.2.3.1 by participation in 2 plenary meetings within 4 consecutive plenary meetings

1.2.3.2 one interim may be substituted for a plenary

1.2.4 Voting rights may be lost:

1.2.4.1 after failing to pay the conference fee

- after missing two out of three consecutive letter ballots

1.2.5 Current state of member status:

1.2.5.1 Voting members

1.2.5.2 Aspiring voting members

1.2.5.3 Nearly voting members

1.3 Attendance list, Register

1.4 Administration: The attendance list was circulated, Richard Paine supervising - 75% attendance according to the attendance list is required to qualify for participating in the meeting as a whole, so make sure to sign the book. Copies of the attendance list are handed out before the end of each meeting.

1.4.1 important for administration of voting rights that the attendance book is used properly.

1.4.2 sign per meeting (morning, afternoon, evening). Do not sign ahead.

1.4.3 place initials. Do not cross or underline.

1.4.4- circle the letter corresponding to the meeting you attend when signing (F=full 802.11, P=PHY, M=MAC group).

1.5 Check e-mail addresses in the book:

1.5.1 some addresses have been struck, or have a \$-sign added to the right - those received complaints from the reflector

1.5.2 please strike your e-mail address if you do not use it

- if you do not disagree to receiving very long files, mark bulk e-mail with yes

Logistics: Document distribution is done using pigeon holes - you will find your copies and messages in the referenced location in the expanding file folders in the slot *in front of* your name.

Conference fee to be paid through registration office.

Copying and collection of files is managed by Stuart Kerry assists in the pigeonhole stuffing. Stuart is also in charge of document numbers.

Coffee breaks at 10 AM and 3 PM. Noon to 1:00 PM lunch

Document distribution:

- sign in for a slot, remember the letter and number
- pigeon holes are file folders with a letter id on each folder and a number on each slot
- in each folder are numbered slots, each of which is 'owned' by a person
- each person owns slot in front of number

1.5 IEEE Patent Policy Vic Hayes explained the IEEE Patent Policy as per Clause 5 of the IEEE Standards By-Laws and per Clause 6.3 of the IEEE Standards Operations Manual. He specifically asked for notification from members of patents applicable to the Published standards or draft standard and that patent holders submit the requested statement.

1.6 Other announcements

- Viewgraph projectors will be evaluated
- Offer is made to hold the May interim meeting in the Netherlands, nobody had objections to the need to travel abroad.
- The minutes from the last meeting for TGa and TGb have spelling errors to corrected by the respective chairs.
- General information available on diskette from
 - 1 diskette with relevant documents mailed
- Every two years the officers must be reconfirmed
 - Vic Hayes is available to be voted chairman for one more time
- Straw poll conducted to ensure there are sufficient voting members for a quorum. 25 voting members are required and 25 were present.
- Current voting membership:
 - 53 -3 (dropped after the last letter ballot) =50 voting. One was added back because his fax was lost.
 - 23 nearly
 - 52 aspirant

2. Approval of the minutes of previous meetings

2.1 Minutes of the Montreal meeting The chair commented that the Minutes of the Montreal meeting, 11-97/138, need to be changed in the following way:

- The nearly voting members in the attendance list need to be made members,
The two TG chairs need to be added to the footer on the front page
The names of the members in the document need to be corrected.

Motion 1: *To approve the minutes as amended,*

moved by Bob O'Hara,
second by Harry Worstel,

Result: 23-0-3

motion 1 passes

2.2 Matters arising from the minutes: there were none.

3. Reports

- 3.1 the Executive Committee ExCom** meeting report made by Vic Hayes. The two PARs, 802.11 (maintenance) and 802.11c were approved. There were no other items important to 802.11 business.
- 3.2 the Standards Board meeting in December** All three PARs, 802.11b, 802.11c and 802.11 (maintenance) were approved with some minor changes in titles. The PARs, as approved, are published in docs: 98/4, /5, /6 and /7.
- 3.3 the Letter Ballots** All motions of the latest letter ballot were approved. Document 98/13r1 is a report on the letter ballot.

4. Review of Contributions Stuart Kerry gave a report of the status.

5. Adoption of Agenda

Vic Hayes reviewed the agenda and proposed additions to the published agenda. Additions are:

- 6.0 Unfinished business
- 6.1 Liaison to WINForum
- 6.2 RFID
- 6.3 Maintenance
- 6.4 TGa work
- 6.5 TGb work
- 7.0 New business
- 7.1 RFID

Motion 2: *To adopt agenda 11-987/158-r1 as amended,*

moved by Tom Siep
John Fakatselis seconds,

Result: 23-0-0

motion 2 passes

6. Unfinished Business

6.1 WINForum liaison. Don Johnson gave an update on WINForum and submitted a letter of liaison for approval. Doc: 98/9.

Motion 3: *To approve submission of doc 98/09 to SRDC as the 802.11 position, with a copy to ExCom,*

moved by Don Johnson
Richard Paine seconds:

Result: 20-0-5

Motion 3 passes

7. New Business

New business discussions led by Vic H.

7.1 RFID Vic Hayes presented a document (98/31) on proposed changes to the use of the 2.4 GHz spectrum. The proposal is to permit FH RFID devices to transmit higher power than 802.11 devices in Europe.

No further discussion or new business. This meeting is adjourned until Wednesday January 21, 1998. TGa and TGb meetings occur during this time.

8. Meeting adjourned for the day by Vic Hayes at 10:30.

Wednesday 21, January 1998
13:00

9. Plenary session opened by Vic Hayes at 13:00 with introductions. There were 56 people in attendance. Secretary: Kent Rollins for this session.

For general information about the Working Group visit their Web page or contact John Fakatselis, Task Force Chair, or Vic Hayes, 802.11 Chair.

9.4.3 Extension for the ISO standard delayed to 2 April. Per ITTF circular dated 1998-01-08, the closing date for voting on ISO/IEC DIS 8802-11 has been extended to 2 April 1998.

Checking possibility to delay until March meeting. else need to send comments from this meeting

9.4.4 web and ftp sites New address: <http://grouper.ieee.org/groups/802/11>.

9.4.5 Tutorial at next meeting At the Montreal meeting, Richard Paine and George Fishel proposed to the chair to arrange for a tutorial at March meeting regarding "Wearables" or "Personal Area Networks".

Through the Standards Board and the ExCom we received a proposal for a PAR for same, but it was questioned whether it belonged to 802.11 or even to 802. A tutorial was proposed.

Tonight Bob Heile and Ian Gifford will come for an informal meeting to prepare for that tutorial.

Note: Eventually Ian Gifford and Bob Heile arrived on Thursday AM, Informal meetings were held and TGb spend some time in the afternoon on subject matter.

If you want to participate, let chair know.

9.4.6 Projector questionnaire needs final review.

9.4.7 Status of proposals on web Chair request to have a matrix of the various TGa and TGb proposals with proposer name, main characteristics and status for posting on the 802.11 homepage.

One or two pager requested from proposers with the important characteristics so they can be linked from matrix.

Have the result before Friday noon.

9.4.8 Boeing Tour Boeing tour scheduled for Thursday and Friday. 30 attendees requested Thursday. Sign up sheet available at the next break. Scheduled for 9:15 to 12:30.

No announcements from the floor.

10. Old Business

10.1 802.11 maintenance report. Bob O'Hara not available. Henri Moelard presented results.

Dean K. asked if adding more countries is within the scope of the PAR.

Ron Brockman identified MIB changes. Asked for a list of the technical changes for Friday.

Motions to approve are moved to the Friday agenda.

10.2 802.11c report. Ron Brockman reports: Processed all of the comments. Text is not available. Moved to Friday's agenda.

10.3 Electronic distribution at meetings There was a discussion of electronic distribution of IEEE 802.11 documents. 80% requested electronic distribution. Methods considered were diskettes, memory cards or WLAN. Netwave (Darwin E.) offered to bring FH and DS access points and 5 PCMCIA cards. Someone will need to provide a server.

In was noted that not all of the attendees can use the memory card. However the majority of attendees have been able to use it. The economic justification for the memory card was presented:

Distribution Medium	Interim Meetings		Plenary Meetings	
	Paper Only	Paper and Disk File 20% Require Paper	Paper Only	Paper and Disk File 20% Require Paper
Number of Attendees	70	70	110	110
Number of submissions	56	56	127	127
Mean number of pages per submission	9	9	9	9
Number of copies	70	14	110	22
Kinkos cost per sheet	<u>\$0.08</u>	<u>\$0.08</u>		
Cost using Kinkos	\$2,822.40	\$564.48		
Net savings				<u>\$2,257.92</u>
IEEE cost per sheet			<u>\$0.05</u>	<u>\$0.05</u>
Cost using IEEE			\$5,657.85	\$1,131.57
Net savings				<u>\$4,526.28</u>
Cost of ATA Flash memory card 40Mbyte	\$500.00			

Dave Bagby: Will the fees be reduced do to cost savings? No, it is mostly savings to the attendees.

Motion 5: *Move to limit paper distribution to people that have no PC nor Mac whilst attending the meeting, currently estimated to 20 % of total.*

Moved by Stuart Kerry
Dean Kawaguchi seconded.

No discussion. All attendees to vote:
result: 45-0-1 (3 not voting).

Motion 5 passes

Discussion to select distribution method.

Straw poll: Diskettes only 0
Diskettes and memory card 49
WLAN 9

John C. Can we have attachment to 10baseT? Yes. Harry W. Trial for the next meeting? Technical support can be provided by Netwave. Options for combinations of distribution media were discussed:

Straw poll: memory, disks, and WLAN: 13
memory and WLAN.25

Motion 6: *to select flash card and a trial 802.11 WLAN for the electronic distribution of documentation during March meeting, without diskette with 20 % paper.*

Moved by Stuart Kerry.
Seconded by John F.

Result: 25-0-1.

Motion 6 passed

Questions were raised about installation procedures for the WLAN. Naftali: Can there be incentives for keeping file sizes small? Tabled until next item on document format.

10.4 Working document formats The next discussion was to decide the format for working documents:

A straw poll was conducted about the versions of MS Office that the attendees. Straw Poll results were:
Office 97 with SR1 patch. (Patch corrects transfers to Office 95). 14
Office 95: 27
Planning to change to Office 97: 10

Plan to go Office 97 for 802.11? 1

John C. Switched to Office 97. Works well. Dean K.: There is no Mac version of Office 97 available today. There is no Power point converter for use with MACs. Stuart K.: Indicated that conversion programs from 95 to 97 are available. Darrel: What about using just Word 97? Because PowerPoint and Excel are also used. Jeff A.: Attendees from large companies cannot decide on software used since this is controlled by the corporate MIS department. Dave B. Suggested that this be an offline decision with the officers. It was decided that the final decision will be provided at Friday's WG.

There was also discussion of the Acrobat version; 3 or 3.02? It was decided to defer further discussion until Friday

10.5 Draft Standard Format The format to be used for the draft standard was discussed. IEEE now uses FrameMaker for Mac. There is a tedious conversion process to/from Word.

Some discussion on using FrameMaker. Dave Bagby: It is difficult to use. Duane Hurne: Also said it is hard to use. Naftali: Recommend that we continue to use Word and PowerPoint. Stuart K.; Recommended against FrameMaker. Should be resolved with IEEE secretary. John F. Against FrameMaker. This will also be discussed on Friday. Dave B: Requested that we use long file names. Vic Hayes: Not sure how to come up with filenames to avoid duplicates. Dave B. Offered to help with an approach.

Some attendees indicated that MS Mail Remote has problems with long file names. Some users can't use long file names. A recommendation will be made Friday.

10.6 TGa report Naftali: Minutes from last meeting were approved minutes. There are 6 proposals. 5 have provided updates and one will be done tomorrow morning. Assessed relative criteria. Sensitivity not a major concern. Simple 100-150 ns multipath should be supported. Radio requirements: baseband complexity, power consumption, interference sensitivity and bandwidth are important.

10.7 TGb report John F. No motions to forward to plenary. Technical presentations: 3 new proposals, 4 of 7 provided additional submissions. 3 were withdrawn. Schedule problem for one others satisfied with other proposals.

Meeting held to discuss process methodology. Continue to discuss. It was agreed that the selection will move from March to May. There was concern that the meeting in the Netherlands in May should be moved to the US. Follow-up meeting tonight with a paper presented Friday.

11. New Business There was no new business.

RFID issue. Documents available and comments sent to CEPT. Request for a volunteer to make to comments to CEPT. None. Vic Hayes will try to follow up.

12. Adjournment for Subgroups at 14:50, TGb this afternoon. A meeting on determining the selection process will be held tonight.

Meeting Minutes for Friday, Jan 22, 1998 for Plenary

14. Opening of the meeting

14.1 Announcements

14.1.1 Results of the questionnaire was for the Toshiba TLP-511U with camera with 173 preference level and Sanyo PLC 5600 N with 116.

14.1.2 Format of the submissions is Office 95, Acrobat reader 3.02.

14.1.3 The Chair rules that it is mandatory that submissions in Word or Excel are based on the template (subportr.dot and sublands.dot) and are saved in Word 95 or Excel 95. The chair further rules that it is mandatory that submitted presentations in PowerPoint are based on the example presentation, have the headers and footers adjusted on the slides, the handout master and the notes master AND are saved as V4.0. Without compliance the subject matter can not be presented or distributed.

14.1.4 File naming will be long file names with the document number format as used today plus the letter for the group the document is addressed to. Then the first 10 words of the title are added or a string according to a recipe to be provided by Dave Bagby. An example is as: [80437A TGa minutes.DOC]. The A is so users can sort by group.

14.1.5 Recognition for the help setting the meeting up! Esta Crepps and Roy Sebring of Intermec for hosting the meeting and Richard Paine for the tour at Boeing.

14.1.6 Dave Bagby reported a request from Microsoft for 802.11 compliant products to get into the Beta program for NT 5.0 . This will have them place the *.inf file into the CD ROM that ships. See the E-mail on the reflector.

14.2 Document list update Now at 98/61 Summary report for task group B

14.3 Agenda adjustments

Motion 7: to approve the agenda as modified.

Moved by Naftali Chayat
Stuart Kerry seconds.

Result: 19/0/0

Motion 7 Passes

15. Reports from subgroups

15.1 Report from TGa by Naftali Chayat. The task group received 6 proposals and none were withdrawn. Had lively discussion of the performance metrics. Most were most interested in robust performance in multipath in low to medium ranges.

Prepared a document which is the performance matrix to be filled in for each proposal to make apples to apples comparison. Added a phase noise criterion and formula.

Motion 8: to allow minor changes to existing TGa proposals before performance data submissions.

Moved by Naftali Chayat,
Stuart Kerry seconds.

Discussion: Jan Boer: what if two companies combine their proposals? Naftali: that would be OK

Result: 15/0/2

Motion 8 passes

Motion 9: *to approve the document 98/57 as the template for performance comparison submissions.*

Moved by Naftali Chayat,
John Fakatselis seconds.

Result: 17/0/2

Motion 9 passes

Naftali showed a document to be placed on the reflector to show the status of the group at the end of this meeting. Document is 98/60. Word smithed by audience. Includes a matrix of the features of the 6 proposals. Tabled to allow time to distribute the document so it can be voted on.

15.2 Report from TGb 98/61 by John Fakatselis: Reviewed a total of 17 submissions which had two new proposals and 4 previously submitted. The group worked on the schedule and criterion matrix.

Motion 10: *to approve 89/54 as the schedule and modulation selection process for the 2.4 GHz higher rate PHY.*

Moved by John Fakatselis,
Jan Boer seconds.

Result: 18/0/1

Motion 10 passes

Straw poll indicated that the Netherlands is still a candidate for the May meeting
Showed the summary of each of the proposals as submitted by each of the presenters.

Motion 11: *to adopt document 98/61 as the report for TGb's meetings.*

Moved by John Fakatselis,
Roy Sebring seconds.

Result: 17/0/1

Motion 11 passes

15.3 RFID report Don Johnson

Motion 12: *to submit the comments on RFID as proposed in doc 98/59 to CEPT/FM project team SE24.*

Moved by Stuart Kerry,
Second by Darwin Engwer.

Result: 19/0/2

Motion 12 passes

15.4 TGc Report Bob O'Hara: Developing a supplement for 802.1b. Resolved 22 letter ballot comments. All changes are available. No significant new issues.

Motion 13: to submit 802.11c/D2 to WG recirculation ballot.

Moved by Bob O'Hara,
Victoria Poncini seconds

Result: 18/0/1

Motion 13 passes

15.5 Report from Maintenance group by Bob O'Hara: Received 63 letter ballot comments and resolved all. All changes are available.

Addition of new regulatory domains. Remove PHY constants from the MIB and defined a new PHY service primitive to provide the identical information to the MAC. Addition of several new attributes to the MIB.

Motion 14: *to submit 802.11revD2 to WG recirculation ballot after the editor has made all the changes as instructed by the disposition of comments column and after review and revision of the MIB syntax by Rich Ozer.*

Moved by Bob O'Hara,
Darwin Engwer seconds.

Result: 17/0/2

Motion 14 passes

Motion 15: *to advise the US TAG for JTC1/SC6 and JTC1 to vote disapprove on the ballot on DIS8802-11 and to submit document 802.11revD2as completed and reviewed, as the comment accompanying the disapprove vote of the US Body; the vote to be changed to approve if the changes are adopted.*

Moved by Bob O'Hara,
Darwin Engwer seconds.

Result: 17/0/4

Motion 15 passes

15.1 Report of TGa continued Review of the matrix of features contained in document 98/60 by Naftali.

Motion 16: *to adopt document 98/60 as the summary report of TGa's meetings.*

Moved by Naftali Chayat,
Bob O'Hara seconding.

Result: 13/0/2

Motion 16 passes

16. New Business

16.1 Output documents All were covered by motions

16.2 Next meeting Naftali and John Fakatselis will bring the proposals and schedule directly to Vic

16.3 Other Interim meeting required

Motion 17: *to have an interim 5 day meeting in Utrecht in the Netherlands May 4-8 or 11-15 depending on related events.*

Moved by Jan Boer,
second by John Fakatselis.

Discussion: Mr. Mori invited the group to have the meeting in Japan. Straw poll showed slight favor for Utrecht over Japan. Mr. Mori would be willing to organize the September meeting in Japan

Result: 9/3/3

Motion 17 passes

Motion to adjourn

Moved by Stuart Kerry, second by Harry Worstel. Passed by voice vote (unam).

Attendance list for minutes

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Tentative minutes of the IEEE 802.11 TGa (5 GHz) meeting held at Lynnwood, WA, January 19-23, 1998

Chair: Naftali Chayat

Secretary/Editor: Mike Trompower

Monday, 19 January 1998

meeting called to order at 11:00 by Naftali

Set Agenda:

- approval of Minutes from November Meeting
- review of current submissions
- acceptance of new modulation submissions
- acceptance of other papers not directly related to modulation methods
- set agenda for March Meeting

Motion 1(approved by unanimous consent): motion to approve agenda as established above

Motion 2(approved by 20-0-5): motion to approve minutes of November meeting task group A

New Document list is the following:

- OQM PHY - Naftali (98/21)
- OFDM Phy - Richard VanNee (98/12)
- QPSK Phy - (98/34, 98/35)
- OFDM - (98/02, 98/03)
- Bi-Orth - Cafarella (98/17,98/13)
- L-PPM - Reza Ahi (98/38)

No new modulation methods were introduced

No other submissions were requested.

Tuesday, 20 January 1998
meeting called to order at 08:30 by Naftali

presentation of document 98/12 by Richard VanNee
title "OFDM Physical Layer Specification"

- Key OFDM parameters
 - bit rates of 10,20, 30Mbps in order to allow comparison
 - 48 subcarriers, 64 point fft, 4.8us symbol time, 800 ns guard time (allows 200ns delay spread handling at 20Mbps), 16-QAM and QPSK, coding rates of 1/2 and 3/4, channel spacing of 15MHz
- Channelization
 - spectrum mask shows 3dB bandwidth of 12 MHz and 20dB bandwidth of 15 MHz
 - allows 5 channels in 100 MHz with 12.5 MHz of guard bands at edges
 - allows 11 channels in 200 MHz with 17.5 MHz of guard bands at edges
- Frame Format
 - SYNC pattern = 11symbols OFDM symbols
 - SIGNAL field = 2 symbols of OFDM symbols
 - scrambling must start from the beginning of the Service field
- Coding and Interleaving
 - rate 1/2 length 7 convolutional code, puncturing 2 out of 6 bits gives rate 3/4
 - block interleaver over 1 OFDM symbol providing interleaving depth of 4.8usec
 - gray code mappings to make QPSK or 16-QAM from binary code output
- Training Structure
 - 1usec short training symbols for resolving frequency errors up to 500 KHz
 - 4.8 usec training symbols used for channel estimation
 - length 12 and length 48 complementary codes used to get training signal with peak to average -power ratio of 3dB
 - 4bits of information on modulation and coding by QPSK modulation of two short training symbols
 - BPSK/QPSK/16-QAM/64-QAM
 - coding rates of 1/.75/.5/??
- Questions
 - there is the potential for near-far problems as with any other system. an adjacent channel with higher power would interfere (adjacent channel) at greater levels but the author believes that coding would overcome the interference.

presentation of document 98/03 by Hitoshi Takanashi
title "Performance of DQPSK-OFDM in Multipath Rayleigh Fading Channels"

- Key OFDM parameters
 - very similar to Lucent proposal - bit rates 20Mbps, 48 subcarriers, 64 point fft, ??us symbol time,
- Description of Channel Model
 - 18 pulses
- Conclusions
 - can handle delay spreads of 400ns and more is tolerable
 - OBO (output power backoff) of 4 or 5 dB is enough
 - can adopt Hiperlan spectrum allocation
 - 20dB Eb/No is needed in Rayleigh fading channel
 - propagation loss of up to 92dB is possible in Rayleigh fading

presentation of document 98/02 by Hitoshi Takanashi

title "Proposal for 5GHz modulation"

- PLCP Specification
 - uses AGC-pull-in and synchronization symbols
 - the header and crc is protected by FEC
 - transmit and receive procedures will need bit stuffing to get full sybols
- Key points
 - 96 bits per OFDM symbol
 - modulation causes a DC offset so that the center carrier which is affected is not used to transmit any data.
 - raised cosine windowing is used to reduce adjacent channel interference
 - 84 samples per symbol - 64 point FFT, 12 ???, 4 ???
- Questions
 - bandpass sampling could be used to avoid DC offset problems (single A/D and AC coupling)
 - European Digital Audio Broadcast is an example of a system that does not use the center carrier to avoid DC offset problems

presentation of document 98/17 by John Cafarella

title "Proposal for 5GHz Physical Layer Specification"

- Key parameters
 - removed SERVICE field because it is not used
 - 40 symbol SYNC, 1 symbol SFD, 1 symbol SIGNAL, 3symbol LENGTH, 4symbol Reed-Solomon CRC
 - LENGTH field reports the number of data bytes (not the time in microseconds)
 - bit rates of 2,8,12,18,24 Mbps
 - channelization = 48MHz each, 2 channels per 100MHz, 6 channels possible in 5GHz
 - different data codes (and/or search codes) can be used to provide additional channels
 - scramble codes can be used to provide additional channel separation
 - significant overlap of cells, requires frequency separation,
 - minimal overlap of cells only requires the use of different codes
 - frequency tolerance of +/-10 ppm,
 - chip clock tolerance of +/-4ppm
 - slot time of 25usec, TX/RX = 10usec, RX/TX=5usec, CCA=10usec
 - -80dBm RX sensitivity (could do better if the manufacturer chooses)
 - 35 dB adjacent channel rejection is specified.

presentation of document 98/34 by Tomoki Ohsawa

title "QPSK Modulation for 5GHz (comparison)"

- Key parameters
 - QPSK modulation
 - root Nyquist filter with 50% rolloff
 - 10 and 12.5Msymbol/sec
 - FEC (31,26) BCH
- review of receiver architecture
 - description of symbol state transitions
 - correlation function of SEQ64
 - receiver performance using 64 and 1000 bytes packets was shown with AWGN and various delay spreads with and without FEC
 - adjacent channel separation of 17.5 MHz is suggested to get 20dB of isolation

-description of AFC structure - about 30ppm tolerance is required for reasonable performance
CCA mechanism using envelope detection was described (less than 5usec processing time)

- Frame Structure
 - 124 symbol SYNC, 8 symbol SFD, 16 symbol PLCP
- Channelization
 - 18.75 MHz per channel
- Questions
 - the presenter proposes that the final version will have only one symbol rate and they have not determined which is the best rate

presentation of document 98/21 by Naftali Chayat

title "Proposed text for Offset QPSK Modulation for 5GHz"

- Key parameters
 - previous presentations stressed similarities to HiperLan. This time this criteria is removed.
 - 21Mbps (up to 50Mbps) using 25Msymbol/sec rate
 - Rate field is defined to be 4 bits with 2 bits being used to identify the coding method used.
 - proposed code is (31,26,3) Hamming code
 - interleaver structure is changed from previous submission. now proposing a parallel scheme in order to take advantage of no latency of filling the table on transmit process
 - Method supports future channel hopping definition, however difficulties of hopping over channels in UNII band with different transmit power requirements should be considered
 - 40ns symbol time
 - proposal to use 800ns air propagation time
- Frame Format
 - 256 bit total: 96bit sync (3 x 32 repetition), 128 bit SFD, 32 bit tail + PLCP information + CRC
 - 4 bit RATE signaling (2 for rate, 2 for coding)
 - 8 bit reserved field
 - synchronous scrambler as used in current FH system
- Channelization
 - 25 MHz spacing
- Questions
 - why are most proposals using relatively weak coding schemes rather than specifying a better trellis code?
 - soft decoding methods could be used to get simpler implementations? hard decoding method gives about 2dB coding gain

Wednesday, 21 January 1998
 meeting called to order at 08:30 by Naftali

Naftali reports on evening meeting in which TGB (high speed 2.4GHz task group) has made the decision to delay the selection of a modulation until May 1998. He asks the feeling of this group whether to adopt the same time frame or continue upon the current schedule which requires a modulation selection in March 1998.

general feeling of group is that each person will interpret (and weight) the comparison criteria according to his particular needs/requirements.

Naftali creates a straw poll to determine the relative importance of the current list of criteria in attempt determine the groups ability to choose a single modulation in March.

NOTE: (there are approximately 45 attendees in the room)
 discussion which occurred before each straw poll follows the table

Criteria Parameter	Definition	Relative Importance
Sensitivity	those that feel sensitivity is MAJOR parameter	YES=5 / NO=2
Multipath robustness (using current noise free model with 10% PER at 20Mbps)	assuming receiver complexity is: 50ns a suitable minimal delay spread requirement 100ns 150ns 250ns	complex/simple/noneed C=0 / S=24 / N=0 C=2 / S=21 / N=0 C=16 / S=9 / N=2 C=0 / S=2 / N=20
Radio requirements: PA backoff linearity phase noise frequency stability	How many feel that the radio requirements will be the MAJOR reasoning affecting their choice of a modulation scheme?	(YES=17 / NO=3)
Baseband processing complexity	How many feel that the baseband processing complexity will be the MAJOR reasoning affecting their choice of a modulation scheme?	(YES=18 / NO=2)
Power consumption	How many feel that the product power consumption will be the MAJOR reasoning affecting their choice of a modulation scheme?	(YES=17 / NO=1)
Reuse related parameters CCI and ACI BW / # of channels restricted band edge performance	those that feel CCI and ACI is important? those that feel channelization is important? those that feel performance at band edges is imprt?	(YES=19 / NO=0) (YES=24 / NO=0) (YES= / NO=)
Special Technologies		

general discussion:

Sensitivity:

- sensitivity is a nonlinear function and difficult to quantify across implementations and differing modulations.

Multipath Robustness:

- multipath tolerance is not enough of a measure by itself, this measure must also account for noise models as well. additionally the measurement must be taken near the receiver's noise floor.

- we are reminded of a previous paper which reported that typical office environments have about 30ns delay spread whereas warehouses have about 200ns delay spread. the paper suggested that 50ns delay spread be used for modulation comparison purposes.
- It is pointed out that today's typical users will want high speed and want connectivity simultaneously in both environments.
- measurements performed by several companies show that multipath affects can be assumed constant for packet lengths of at least 1ms. non mobile environments can have stability for 5ms packet sizes.
- a vendor implementation may support greater delay spreads by switching to a lower rate. The selection ought to take into consideration that a lower rate support is favorable

Radio requirements

- there should be a cost limit placed on the implementation in order to have a reasonable comparison. Solving phase noise problems and frequency stability issues can be solved by applying more resources. PA linearity affects power consumption and cost. It was pointed out that IEEE cannot discuss the cost of implementation but only have work towards a technical solution providing interoperability.

Power consumption

- the consumption measured for the whole product.

Reuse Parameters

- band edge and regulatory restrictions are not uniform from domain to domain and provide for irregular specifications
- some implementations may choose to back off power in order to meet (help meet) the restrictions
- should the standard support multiple spectral masks for multiple power levels and/or bands

Thursday, 22 January 1998

meeting called to order at 6:30PM by Naftali

presentation of document 98/38 by Reza Ahi

title "LPPM Modulation Physical Layer Specification"

- Key parameters
 - bit rates of 10 and 20 Mbps
- Frame Structure
 - 12symbols for AGC, 8symbols for sync, 40symbols for diversity, 4 for resync
- channelization
 - 26.6 MHz bandwidth using about 23MHz between center frequencies
 - 3 channels per 100MHz UNII bands
 - expect about 30dB adjacent channel rejection (still under investigation)

questions

-Naftali presents argument that actual channel bandwidth is closer to 80MHz.

-Reza states he will confirm for next meeting.

-Reza confirms that there will slight variations in packet size and precise determination of packet size will not be possible.

-Reza states that the advantage of using 'differential' PPM is to increase the data rate. The average pulse length will be 200ns instead of the maximum length of 330ns

Naftali reviews the criteria (97/62r2) required by the presenters to make public before the March meeting (Feb23).

establish agenda for March meeting

-Review of Proposals

-presentation of submissions

-

March agenda approved by consensus

meeting closed 3:00

**Submission to:
IEEE P802.11
Wireless LANS**

**Tentative minutes of the IEEE 802.11 TGb (2.4 GHz) meeting held
at Lynnwood, WA, January 19-23, 1998**

Date: January 1998

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Minutes for the Task group b meeting

Jam 19, 1998 PM

Meeting opened by John Fakatselis-Chair.. Carl Andren-Secy

AGENDA FOR JANUARY 98 MEETING

- **APPROVAL OF MINUTES**
 - **APPROVED 23-0-4**
- **BACKGROUND**
- **WLANA REPORT**
- **DISCUSSION ON SCHEDULE AND CLOSURE PROCESS**
- **TECHNICAL PRESENTATIONS**
 - **GENERAL ISSUES**
 - **98/32 MAC REQ. FOR HIGH SPEED (R. BROCKMANN, NWN)**
 - **98/33 HIGH SPEED PLCP (R. BROCKMANN, NWN)**
 - **98/23 FCC FOR DS (CHAYAT, BREEZECOM)**

■ 98/37 MULTIPATH ISSUES ARCH. (M. WEBSTER , HARRIS)

■ NEW PROPOSALS

- 98/1 CFO -SS (ISHIKAWA, KDD)
- 98/20 MODS. TO MBOK (BRODSKY , RAYTHEON)
- 98/24 2.4 GHZ PROPOSAL (HEEGARD, ALANTRO COM.)

■ PREVIOUSLY DISCUSSED PROPOSALS

- 98/11 BCPM (JAN BOER, LUCENT)
- 98/10 DRAFT TEXT (JAN BOER, LUCENT)
- 98/16 2.4 GHZ PROPOSAL (J. CAFARELLA, MICRILOR)
- 98/18 PERFORMANCE (J. CAFARELLA, MICRILOR)
- 98/25 2.4 GHZ PROPOSAL (C. ANDREN, HARRIS)
- 98/26 GBT9 MULTIPATH (DRAPER, GBT)
- 98/27 GBT9 IMPLEMENTATION (DRAPER, GBT)
- 98/29 GBT9 THROUGHPUT (DRAPER, GBT)

■ SCHEDULE AND CLOSURE PROCESS (CONTINUE)

■ AGENDA FOR MARCH MEETING

Rough Graphic Outline

	Monday	Tuesday	Wednesday	Thursday	Friday
AM	Full 802.11 TGa <i>Rainier</i>	!main- TGa !te- !nance <i>Baker! 301</i>	!main- TGa !te- !nance <i>Baker! 301</i>	Excursion to Boeing	TGb <i>Baker</i>
PM	TGb <i>Rainier</i>	!main- TGb !te- !nance ! <i>Baker! 301</i>	Full 802.11 TGb <i>Baker</i>	TGb <i>201 + 301</i>	TGa Full 802.11 <i>Baker</i>
Evening	TGb or Combined TGa and TGb	TGb <i>Baker</i>	TGb <i>Baker</i>	TGa <i>201 + 301</i>	

Legend: = flexible adjournment/Start

Approval of minutes ... Passed (23-0-4)**Background by: John Fakatselis (chair)****WLANA report by: Jeff Abromowitz- 3COM**

WLANA(Wireless LAN Alliance) is a PR org that promotes Wireless market growth. Who are the High Speed 802.11 customers? Who are the likely customers for each market segment? High speed is primarily targeted at corporate market as opposed to small office or SOHO.

Discussion of the schedule and closure process

How does the committee get to closure? Is the March meeting the one? Jon Borne suggests that we make a trade matrix and fill in the blanks. A suggestion was made to a small group of people to go off and make proposals for evaluation. Volunteers: Duane, Al Petrick, Tan Hue, John F.

Technical Presentations**General Issues**

98/32 MAC requirements for the high speed PHY (NWN, Brockman). Issues derived from the MAC are to minimize the loss of bandwidth due to collisions and cell planning. Inter cell time division use physical and virtual carrier sense. Code division suffers from the near-far problem. MAC will reduce to ALOHA in this case. Frequency division provides good isolation between cells. The optimum number of channels.

Questions: Dean: Near Far with CDMA gives 12 dB versus 40 dB with FDMA. Backwards compatibility with FH? Duane: Does channelization conflict with anything else that exists in the ISM band. Bob O'Hara. What isolation is available with CDMA? Chan: CDMA with short codes is too weak to do discrimination between nearby. Jeff Fisher: Adjacent businesses use TDMA Darrol: AP coordination is not in the standard, so frequency planning is needed. Dean: The assumption of a clean spectrum is flawed.

98/33 High Speed PLCP (NWN, Brockman)

The option for the HS header is flawed in that the rate field and length field do not uniquely specify the length of the packet in microseconds. Proposed solution uses service field MSB for the extra resolution. Jon: Current stations will drop the packet if the service field is non zero. Dean: Is there a mandate to not change the existing PHY? John F. : The PAR did not specify that the PHY not be changed.

98/37 Multipath Issues (Harris, Webster)

Linear Channel distortion drives receiver complexity. A 100 ns delay spread has significant energy to 600 ns. If the symbol length is much longer than the channel delay spread as in OFDM, you can mitigate the multipath. Broad bandwidth using a RAKE process needs good correlation properties that detract from the data carrying capability of the waveform. You can get 60 ns of delay spread capability with just a few feedback taps. With more taps and FF taps, we can approach 140 ns.

Lucent: Is the impact of the filter important to the performance?

Mark: The distortion due to the channel dominates the performance.

Ad.: Does channel impulse response estimation type effect the performance.

Mark: No, almost any estimator can be used.

John C. : RAKE should not be talked about in the same sense as equalization. Channel filtering can amplify noise, but the FB taps do not.

Vic announced that : The new method of getting data is electronic copy with 20 paper copies.

98/23 FCC issues for DS (Breezecom, Chayat)

FCC conference call results in the desire to redefine the processing gain. The newer waveforms have coding gain that is inseparable from the processing gain. The primary emphasis of the spec is to protect our customers from interference and to protect others from interference from our customers. We should go to the FCC with the approach that we made our best efforts to keep to the spirit of the spec. We should have something in the standard that forces people to make robust receivers.

We should have a multipath simulators such as constructed with cables and attenuators such that all manufacturers can test for robustness.

We should go to the FCC to change the rules for FH as well. Wider FH channels is desirable.

John C. : The idea that the processing gain is defined on other than a symbol is wrong and not inconsistent.

Cees Links: Crest factor is also a reference ratio and Japan's MTT should also be considered.

Greg R.: SNR_{out} vs. SNR_{in} is not the only criterion. BW ratios should be used.

Ken Clemens: What the FCC ruling means that they can't go to court to stop you from transmitting

John C.: The FCC ruling says that the PG is exclusive from the baseband coding gain.

Naftali: The FCC should be supplied feedback.

Mark: NB Gaussian interferer is worse than WB Gaussian noise.

Keith: Suggests that Naftali write a letter to the FCC.

Dean: What is the approach that the letter should address?

Naftali: Our first proposal to the FCC was turned down. We can try the position that this is OK.

Dean: The one thing that does not have any objection to is the definition of Es/N0 as SNR.

John F. : What the FCC wants is that we specify a new test to define PG.

John C.: What we need to go to them with is both a definition and a test.

Straw Poll: Most people (15/6) think that the CW is insufficient.

Mark: We need a definition and then we can architect a test.

Announcement

by Vic Hayes on the public announcement of the PAR

Jan 20, 1998 PM

New Proposals

98/1 CFO-SS (Hiroyasu Ishikawa, KDD)

Carrier Frequency Offset SS for high speed 10Mbps using the current MAC protocol. Japan has only one channel in the ISM band. The spectral mask is slightly relaxed from the IEEE.

The technique uses 5 carriers with Barker code spreading. The receiver used SAW matched filter detection. It does not need an equalizer. It takes 5 channels of 2 MBps terminals. Separations of 1 MHz

are used where the frequency spectrum of the correlation peak has a null. This further spreads the channel power by 5 MHz, so 22 MHz becomes 27 MHz. @ MHz would make the system more multipath robust. Needs the symbols synchronized and the carriers orthogonal. Carrier is analog summation of the 5 channels. Receiver has 5 channels of demodulation with 5 SAWs. Receiver achieves good eye opening at the desired sampling time. Five power amplifiers are needed for the output. Naftali: combiner gives 7 dB loss. Darrol: how is the PN put into the RX? It is in the SAW. Conventional diversity is OK with this technique. Tracking is by time window like conventional 802.11 receiver. For acquisition, the center channel is used and the side channels have non interfering patterns. Suggest 3 & 5 channels with 2 MHz spacing and 17 MHz channel filter BW. They used a two path model to evaluate the performance. Naftali model results next time. $1.0e-5$ BER at about 13 dB Eb/N0 (1 dB IL). Needs 20 dB for PER=10% with 6 dB C/D. BER improves as delay goes to 1 symbol. Allows 3 sub bands in the ISM band. Interference performance unknown. No change in MAC SW. They expect to be completed with test models in Feb. Will demo at NAD'98 in Vegas in April. KDD follows IEEE patent policy. Backwards compatible.

Dean: What is the SAW structure?

Hiroyasu: Full matched filter for Barker code correlation.

Chris: Is the TX power the same for all rates?

Hiroyasu: Maybe. Going from 3 to 5 channels changes the power.

Cees: What is the sampling?

Hiroyasu: For acquisition, it is 44 MHz, but for data demod it is 1 MSps.

Dean: Do you use a 2.4 GHz filter to shape the spectrum.

Hiroyasu: No. Shaping is performed in the transmitter before the upconversion.

Naftali: This is another example of overlaid waveforms. What is it's advantages?

Hiroyasu: It is backwards compatible with the 1 and 2 MBps systems.

Darrol: Do you have a way to get away from 5 Los.

Hiroyasu: We use only 1 oscillator and frequency synthesize (PLL) the others.

Carl A.: What keeps the multiple parallel channels from interfering with each other?

Hiroyasu: The offset in frequency offsets the time response, putting the correlation peak out of the expectation window, preventing the multiple channels from interfering with each other.

98/24 Modulation and Coding in WLANs, Chris Heegard, Alanro

Comments on the current proposals and how they use modulation. Suggests using new metrics i.e. Shannon rather than Eb for energy per unit. Overlapped PPM uses 5 level modulation and that seems to be undesirable relative to the 2 level QPSK. Harris' scheme is one of the original Hamming code with a minimum distance of 4.

Cees: Lucent approach is based on FCC rules and was designed to operate against multipath and this comparison is biased towards sensitivity. They also take issue with the complexity estimates

Chris: PPM introduces memory, so the equalizer is needed even without multipath. You need a lot more SNR to get the error rates.

John C.: We wanted to keep the channel symbol longer to defeat the multipath.

Chris: getting the new systems to work at the same SNR as the low rate systems.

Dean: It is not true that you use longer symbols since you upped the spread rate. The proposals looked at the constraints and implementations that could be sold on the market. Look at Hiperlan and see what we need is an approach that meets these requirements.

Chris: The standard will be a compromise. This is something we should be in the standard.

Darrol: Our simulations show that FEC does not improve the performance enough.

Jon: You should take into account the environment more. Like multipath.

Greg: Would your system be a DS system with 10 dB processing gain?

Chris: A DS system would not have the high rate since SS processing gain depends on having a thin signal spread over a large signal space.

98/20 Proposed Modifications to MBOK, Wesley Brodsky, Raytheon

MBOK needs a 5 dB backoff of the power amplifier backoff. They propose offsetting the I and Q channels by one half chip to be able to use 0 dB backoff and less spectral regrowth. Second, they propose using QMBOK at half spread rate for lower data rate for more channels in the band. This would allow 7 channels for hex cell planning. Third, they suggest 11 chip per symbols. This would eliminate the FCC question. The result would be 8 and 4 MBps rates. The spectrum is minimized at 9 to 10 MHz filter BW. Spectrum is worse with the BMBOK waveform and not conducive to OQPSK techniques.

Darrol: Are there any IP issues with this suggestion.

Wes: No, it is textbook. OQPSK is close to MSK.

Greg: If you take the baseline of 8 chips per symbol, the offset causes 16 phase rotations per symbol. Did this double the Processing gain in so far as the FCC is concerned?

Naftali: There is a duality between OQPSK and MPSK

Don: are you considering compatibility with the low rate systems.?

Wes: No not as a primary consideration.

Previously discussed proposals

Clemens: Siemens, decided not to proceed with their proposal due to not having enough time.

Dean: Symbol has decided not to pursue their proposal since the compatibility with FH has been addressed in several of the other proposals.

Naftali: Breezecom has decided not to continue with its proposal due to limited time to spend on it.

98/26 Performance in Multipath, Golden Bridge Technologies, Darrol Draper

Using 1 to 11 Barker codes gives a variety of data rates. The lower rates handle multipath better. The header is not a contributor to the PER.

98/27 Implementation, Golden Bridge Technologies, Darrol Draper

Basically the receiver structure is RAKE. The correlator is used multiple times, one for each multiple channel. Can lock on with 16 bits of preamble or 32 for diversity.

98/29 Throughput Efficiency, Golden Bridge Technologies, Darrol Draper

The data rate needs to be negotiated, so the existing preamble is desirable. The number of codes and the gap time can be optimized for throughput. Lower rate codes are more optimal for the shorter packets under these conditions. Short headers make the throughput better.

What environments need the high throughputs? An algorithm is needed to decide on the data rate to use. It will most likely be done in the AP.

Cees: You refereed to telephone line modems. There the conditions are more stable.

Wes: The comparison between the telephone modem and the radio is good. In the radio channel, the interference is likely to be variable. The radio channel offers a good bit of variation. Therefore there is a potential to gain a benefit.

Stuart: room 301 has a printer, and Bob O'Hara has the key in room 244

Close for today

tonight there will be an Ad-hoc committee to decide on decision methodology.

Jan 21, 1998 PM

Previously Discussed Proposals Cont'd**98/16 Microlor's Submission, John Caferella**

This proposal is similar to the 5 GHz proposal. There are two bandwidths, full band and half band. The CRC is computed on 4 bit symbols. Suggest synchronous scrambling. Can get up to 9 MBps in Japan. 4X4 coding also used for a spin up mode. Uses a little bit of FEC for a 8.7 MBps mode for better MULTIPATH performance. Single error correcting uses straight through processing. As a practical matter, the DPSK errors are fewer than the MOK errors. So we compute parity on the DPSK part. Uses 40 MHz separation of channels for the full band case.

Mark: how do you decide to use the FEC mode.

John: The MAC does it in retransmissions by specifying the data rate.

Ad: FEC gives gain in noise, but not for specular MULTIPATH or CCI. So it is questionable if it helps.

John: We don't specify FEC for co-channel rejection. The scrambler also helps for this.

Ad.: The gain doesn't apply to specular MULTIPATH

John: That is why we let the MAC pick when to employ it.

Wes: If you operate into a fully saturated PA, what is the backoff?

John: With fully saturated, the sidelobes come up to 40 dB from 50 dB. It is not true that carving up the spectrum into narrow bandwidth is better.

98/18 Performance of the , John Caferella

The RF is the Prism chip set with a lower power PA. The modem is 25K gates with 10K gates for control. (without the enhanced CCA features). The preamble and header take about 30us. 8 search code channels, 48 cyclic code channels. CW PG performance is 14 dB. 12 dB PG against 25% AWGN. Patent still in progress. Senses old systems with enhanced CCA. Will add alternates to the MULTIPATH model. The sidelobes of the response, the largest is -6 dB and most are -8 dB. They suggest 25% BW NB jammer.

Greg: Does the 25% BW give any real difference from WB noise and is it representative of any real jamming source..

John: You need something that represents a large number of NB signals that tends to Gaussian.

Mark: this argument shows that more is needed than just Naftali's model.

John: this shows better PG measure than CW.

Mark: would it be hard to specify your performance in a NB environment?

John: no, but I don't have the time to do it now.

Greg: why did you include other jammers in the standard?

John F.: the selection performance specifies this

Carl: why not use 5 CW jammers

John: The 25% was far enough in the tails to avoid the anomalies and your suggestion is too complicated. How many jammers and how spaced?.

Jeff: we tried this and verified John's anomalies.

??? : Does the 4X4 case defeat the FCC's test.

John: no, the E_s/N_0 goes up by the 6 dB, so the test shows the same.

Wes: Does the waveform itself have a patent?

John: no, the waveform is not patented, only the details of the implementation.

Mark: you prefer a specular MULTIPATH model over a diffuse.

John: I refer to Rappaport's paper where he showed that for 3 different receiver separations as a function of threshold. At the extreme, there is diffuse multipath and noise and at the other, there a few discrete paths that dominate.

Mark: does this make the test we are using useless?

John: no
Ad: which paper do you use?
John: I'll look it up
Dean: when you have MULTIPATH fading, you have to adjust for the fading, what should be the approach.
John: The Naftali model is simple, so it can easily be used.
Dean: take the exponential distr., referencing E_b/N_0 for the fade. What have you picked?
John: I wouldn't do a noise free simulation.
Naftali: It is inappropriate to have a standard where two different chipping rates are allowed.
John: those are not meant to be dynamic. What you do with FDMA in the current standard is just that. They make for channels that do not interoperate.

98/37 Harris' 2.4 GHz submission, Carl Andren

Harris 2.4 GHz proposal

???: Is the equalizer data presented based on simulations.
Carl: Yes, difficult to setup a measurement.
Wes: Do we drop the BPSK mode if we go to OQPSK?
Carl: Uncertain.
Ad Kameron: Co-Channel interference simulation.
Carl: No it is measured data. Transmit in packet mode the interference is continuous.
Ad Kameron: FCC spreading requirements. With the offset does that qualify?
Carl: Still being debated.
John C.: Does change the processing gain change. Changing the code doesn't change. This is not a real improvement, but addresses FCC issues.
Jeff Fisher: 11 chip per symbol? How to transition?
Carl: We Developed clock scheme for that.
Jeff Fisher: are there 8 orthogonal codes at 11 bits?
Carl: There are codes good enough. The Lucent PPM scheme uses trans-orthogonal codes with acceptable performance.
????: Can you use a limiting receiver with equalizer?
Carl: We don't believe we would get good performance, but will try it.
Roberts: Diversity?
Carl: Change preamble for high speed mode.
Darrol: 4 to 1 improvement due to diversity at the most.
Carl: The results are based on measurements.
Darrol: What is the gate count?
Carl: 27,000 gates for the entire baseband processor, 35 K gates for the equalizer.
NCR: What is the S/No in the CW Jamming test?
Carl: We use $E_b/N_0 + ?$ dB. Shown in textbooks. 16.5 dB at 11 MBps.
Jeff F. What was the bandwidth used for the broadband noise?
Carl: We set it to the null to null bandwidth.
Roberts: Filters restrict the noise bandwidth.
Jeff F. Recommends 50 % noise bandwidth. To account for filters.
Ad Kameron: ??
Roberts; State the bandwidth?
Carl: We set to null to null bandwidth. The 90% power bandwidth of the waveform is 12 to 13 MHz.

98/10 Lucent's Draft standard Submission, Jan Boer

Same as previous submissions. They get 5 or 8 MBps. Squeezing by 2 chips give 10 MBps. Very little in the standard needs to be changed. The 10 MBps mode is 9.7777 MBps and they use two rates in the rate field to let the MAC know how long the packet is exactly. By placing the 5 level waveform relative to the 1 and 2 MBps case, the backoff will not be changed.

98/11 Performance of BCPM, Jan Boer

They use a channel matched filter, mode sifter, and tentative symbol estimator. They can use only the CMF for a low complexity receiver. Long preamble is not needed, about 25 us is needed to calculating the channel matched filter. Can do 20 us slot time and do diversity in this time. No change in SIFS time. Theoretical free space range of 1000M. Three dB lower TX power allows about the same power consumption as standard version. Patent may be infringed, see Lucent contact. 24 us for training.

Wes: How much backoff; is it 2.5 dB lower than low rate system?

Jan: Yes, to maintain the spectrum, the backoff needs to be 2.5 dB lower.

Ron: I agree with the cell planning statement, how are you planning to measure that?

Jan: We will discuss that tonight.

Ad: The cell planning may have to take into account the near far problem.

Darrol: What do you mean by infringement?

Jan: contact the lawyers.

Don: does the 8 MBps have FCC problems?

Jan: the 8 MBps has been shown to the FCC, and they gave written approval.

Mark: how many taps are in the matched filter

Jan: 12 taps.

Don: do you feel the need to need to use a QPSK preamble to estimate the channel?

Jan: no, we feel the BPSK preamble is adequate.

Ad: we want to stay interoperable.

Meeting adjourned at 6:15

Everyone invited back at 7:30 for a discussion on selection criterion.

Jan 22, 1998 PM

Demo by Richard Paine on Wearable computer from Boeing

Tutorial by Bob Heile GTE on Wireless wearables.

Uses: Mobile worker, collaborative maintenance, medical sensing. 19.2 to 100 kbps rates plus the usual requirements. 0.5 in^3 . Overlap of multiple networks in same area. Network up to 16 devices. Is .11 the right answer? \$40 price point.

Darrol: what would make anyone think that this is a realistic thing?

Bob: It takes a while to get this technology up to this point, but if we can identify a lower data rate than you are addressing, it may become practical.

<ftp://ftp.flexpc.com/wearables/???>

Notification by Vic. 5 have problem with going outside the US for the May meeting, 6 have problems going into the US. If you have any options, see Vic.

John: Need brief write-up for the web page. Agenda discussion.

98/54 John Fakatselis, Schedule and selection process

Schedule is broken into bi-monthly milestones. March; beginning of the down selection process. May; final modulation selection. July; sept; draft complete. Nov; WG ballot. Jan'99; WG ballot resolution,. March; motion to submit sponsor ballot. May; sponsor ballot resolution. July; sponsor ballot resolution. Sept; standards board approval.

Selection process is structured to happen in the March and May meetings so that one candidate is selected. Document 97/157r1 is the is the formal basis for comparison. Elimination of proposals with incomplete data or not meeting the requirements will be by secret ballot. Establish a comprehensive comparison benchmark matrix. The matrix will be available 2 weeks before the March meeting. The presenter will show their data in the matrix with opportunity to explain the variances. Questioning of the presenters will be performed by the matrix creators. All proposers have closing arguments. Finally, exclusions based on 75% votes (secret ballot) to eliminate. The time between March and May is for the proposers to improve their proposals or combine them prior to final selection.

May final submittals and presentations. Update comparison matrix and presentation of the matrix to the task group. Proposers can make clarification points and closing arguments. Final run off by secret ballot. Adapt the group recommendation with 75% approval vote. Present to 802.11. Address comments and readdress.

Mark: on the multiple rounds, will the voter have more than one vote. Two votes may be better if there are three on the table.

Ad.: Two votes creates difficulties.

John: I recommend one vote for simplicity.

Motion to accept document 98/54 by: Ken/Stewart. 14/0/3 Passes

William Roberts, Carl H. and Naftali volunteered to be the matrix generators.

Agenda for March meeting

Technical submissions

Selection process

97/157r1 John F. Selection criterion discussion.

No comments from the audience therefor the document will stand as is.

98/55 John Fakatselis,. Empirical data taken with Harris' approach

An additional paper was allowed by the group for presentation(98/55). This is a general purpose paper to verify arguments made that multipath performance need to be carefully considered by the group since the empirical data verifies the concern. A short preamble will also improve significantly throughput when short packets are used.

It Showed data taken in the Harris lab. Shows data from 5 test sites in building 62, second floor. With 11 MBps and table rotation,

Ad.: 20% PER is impractical for 64 byte packets

John: That shows that something is required to combat this problem.

Ad.: is this data taken with a full network?

John: no, this is with an almost continuous packet transmission system with no protocol.

John C. where the antennas on the PCMCIA card?

John: no, they were 8 " apart, remote from the PC card.

Announcements:

Jon: there are still places on the tour tomorrow.

John F.: I was very pleased with the way things went this session.

Adjourn.

Tentative Minutes of the Meeting of Task Group C,
January 20, 1998

Bob O'Hara, Chair
Informed Technology, Inc.

Agenda

1. Adopt agenda
2. Address comments received with letter ballot
3. Adjourn

Minutes

1. Agenda adopted.
2. Address comments received with the letter ballot
All comments have been addressed. Refer to doc.: 98/41 for the dispositions
and to doc.: 98/52 for the report to the plenary.
3. Meeting adjourned at 3:25 p.m.

Attendees

Darwin Engwer, Henri Moelard, Tom Siep, Ronald Brockman, Victoria Poncini, Bob O'Hara

Tentative Minutes of the Maintenance Group, January 20-21, 1998

**Bob O'Hara, Chair
Informed Technology, Inc.
151-A Charles Street
New York, NY 10014**

Agenda

1. Approve agenda
2. Resolve letter ballot comments
3. Adjourn

Minutes

1. Agenda approved
2. Resolve letter ballot comments
All comments are resolved. Refer to doc.: 98/42 for the dispositions and to doc.: 98/52 for the report to the plenary.
3. Meeting adjourned at 12:00 noon, January 21, 1998

Attendees

Darwin Engwer, Henri Moelard, Ronald Brockman, Tom Siep, Victoria Poncini, Bob O'Hara