IEEE 802.16 Working Group on Broadband Wireless Access

http://WirelessMAN.org

Dr. Roger B. Marks
325 Broadway, MC 813.00
Boulder, CO 80305 USA
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Fax: +1 303 497 7828
mailto:r.b.marks@ieee.org
29 October 2002

Dear IEEE-SA RevCom:

Enclosed is an application for approval of P802.16a ("Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz").

Attached to this letter, please find the following:

Page 2-5:	IEEE-SA Standards Board Form for Submittal of Proposed Standards
Page 6-16:	Summary of initial ballot
Page 17-27:	Summary of recirculation ballot
Page 28-57:	Unresolved negatives & responses
Page 58-62:	PAR
Page 63:	PAR Approval Letter
Page 64:	Coordination comments & responses

The draft itself (P802.16a/D6-2002) will be included separately in PDF format and supplied to the IEEE Staff Project Editor in FrameMaker format.

Though I answered "Yes" in the submittal form to the question "Is there any patented material in the proposed standard?", I have not confirmed this fact independently. However, several Patent Letters of Assurance have been received in regard to this draft. These will be provided under separate cover.

At the time of this submission, a second recirculation ballot (a "confirmation ballot") has been requested of the Balloting Center, and I am assured that it will open by 1 November. The confirmation package includes draft D6 and the associated changes and comment responses. On the basis of the resolutions, 4 of the 12 Disapprove voters have already indicated the conversion of their vote to Approve. I will provide both recirculation packages upon request.

The PAR answers "Yes" to the question "Sponsor is aware of trademarks relevant to this project?" The relevant trademarks that stimulated this answer are those belonging to IEEE (including 802® and WirelessMAN™). The editorial staff is aware of these issues.

Please feel free to contact me with any questions or concerns.

Sincerely,

Roger B. Marks

IEEE-SA STANDARDS BOARD
FORM FOR SUBMITTAL OF PROPOSED STANDARDS

1. PROJECT NUMBER: P802.16a **2. DATE:** 25 Oct 2002

3. TITLE: Draft Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz

4. SPONSOR (Full name of society/committee): Computer Society/LMSC + Microwave Theory & Techniques Society

5. BALLOTING COMMITTEE: 802.16 Working Group + Microwave Theory and Techniques Society

(Include written delegation of balloting authority.)

6. NAME OF WORKING GROUP: 802.16 Working Group on Broadband Wireless Access

7. NAME AND ADDRESS OF SUBMITTER

Roger B. Marks
NIST
325 Broadway, MC 813.00
Boulder, CO 80305
USA

Telephone: +1 303 497 3037 Fax: +1 509 756 2642 E-Mail: r.b.marks@ieee.org

8. DESCRIPTION OF DOCUMENT (Check one from each column.)

☒ New	□ Standard	☒ Full Use (5-year life cycle)
□ Revision	□ Recommended Practice	□ Trial Use (2-year life cycle)
□ Reaffirmation	□ Guide	
□ Withdrawal	☒ Amendment/Corrigenda to an existing standard (Indicate number and year) IEEE 802.16-2001	

8A. REAFFIRMATION ONLY: In the opinion of the balloting group, this standard continues to be useful in its current form and contains no significant obsolete or erroneous information.
□ Yes □ No

9. BALLOT INFORMATION

List the interest categories of **eligible** balloters only. Refer to the IEEE-SA Standards Board Operations Manual and the Working Guide for Submittal of Proposed Standards for the rules of balloting committee classification.

User	14	Producer	26	General Interest	34	Government	2
Interest Category	No.	Interest Category	No.	Interest Category	No.	Interest Category	No.

SUMMARY OF ELIGIBLE BALLOTS

	INITIAL BALLOT		RECIRCULATION BALLOT (if applicable)	
	Draft D5	Date Closed: 2002-09-04	Draft D5+	Date Closed: 2002-10-11
	Number	Percentage	Number	Percentage
Ballots Mailed	76	100%	76	100%
Ballots Returned	67	88	67	88
Affirmatives	48	80	48	80
Negatives	12	N/A	12	N/A
Abstentions	07	10	07	10

Reasons for abstentions: Lack of time = 4 Lack of expertise = 2 Other = 1

10. RESOLUTION OF COMMENTS AND NEGATIVE VOTES

All balloting group members, observers, and coordinating groups have been advised of substantive changes made with respect to the balloted draft standard (in response to comments, in resolving negative votes, or for other reasons) and have received copies of all unresolved negative votes with reasons from the negative voter and the rebuttal, and have been advised that they have an opportunity to change their votes.

A. Have unresolved negative votes been circulated? ☒ Yes ☐ No ☐ No unresolved votes
Include unresolved negative comments and rebuttal.

B. Have substantive document changes been circulated? ☒ Yes ☐ No ☐ No substantive changes

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11. COORDINATION ACTIVITY (Not required for reaffirmation)

Using the abbreviations listed below, indicate the response received from each committee/organization required for coordination and include a copy of the response. Include documentation authorizing coordination by common membership, if applicable.

R = Received R/C = Received with comment NR = Not received

Committee/Organization	Response	Committee/Organization	Response
SCC10 (IEEE Dictionary)	R/C		
SCC14 (Quantities, Units, & Letter Symbols)	R		
IEEE Standards Editorial Staff	R/C		

Indicate below any unresolved problems from coordination activities.

None. Editorial and SCC10 comments requested no changes.

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12. PATENT/COPYRIGHT and REGISTRATION ISSUES

A. Is there any patented material in the proposed standard? ☒ Yes ☐ No ☐ Originally indicated on the PAR, but not included in the final document
If yes, include letters(s) of assurance from the patent holder.

B. Is there any copyrighted material in the proposed standard? ☐ Yes ☒ No
If yes, include copyright release(s).

C. Is the registration of objects and/or numbers a provision of the proposed standard? If yes, include a proposal for review by the IEEE-SA Registration Authority Committee (RAC). ☐ Yes ☒ No ☐ Already approved by RAC

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13. INTERNATIONAL STANDARDS ACTIVITIES (Not required for reaffirmation)

Is this document intended to be the basis of or included in an international standard? ☐ Yes (Explain) ☒ No

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14. UNIT OF MEASUREMENT (check one)

☒ International System of Units (SI) - Metric ☐ Inch/Pound ☐ Both ☐ Not measurement sensitive

☐ Other _____

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15. Source Materials Submitted to IEEE Standards Department

A. Have electronic versions of the source documents (text and figures) been provided? ☒ Yes ☐ No Format: FrameMaker

B. Will a diskette or other online material be required to accompany the published standard? ☐ Yes ☒ No

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16. Submission checklist (X = included in submittal package N/A = Not applicable)

	Submission Package Item	**List URL if online**
X	This submittal form	
X	Ballot summary form(s) (1 per ballot cycle)	
X	Copies of unresolved negatives & rebuttals	
X	PAR and PAR approval letter	
X	Coordination comments and responses	
X	.pdf of final balloted draft #D6	
N/A	Permissions & copyright releases	
N/A	Delegation of balloting authority	

PROJECT NUMBER: *P802.16a* **DATE:** *29 Oct 2002*

This draft standard has been developed in accordance with the policies and procedures of the Sponsor and I am authorized by those policies and procedures to make this submittal.	
Roger B. Marks	*Chair, 802.16 Working Group*
Signature of Submitter	**Title (role in Sponsor)**

==========

FOR STANDARDS DEPARTMENT USE ONLY

	IEEE-SA Standards Board Chair	
Signature of IEEE-SA Officer	**Title**	**Date**

Return to:

IEEE Standards Department
RevCom Secretary
445 Hoes Lane
PO Box 1331
Piscataway, NJ 08855-1331

Ballot Summary

P802.16a/D5
Closing date: 2002-09-04

1. This ballot has met the 75% returned ballot requirement.

```
    76 eligible people in this ballot group.


    48 affirmative votes
    12 negative votes
     7 abstention votes
=====
    67 votes received =  88% returned
                         10% abstention
```

2. The 75% affirmation requirement is being met.

```
    48 affirmative votes
    12 negative votes
=====
    60 votes =  80% affirmative
```

Ballot Details

Coordination Responses Only

IEEE/Coord Number	Name	Role	Phone / E-mail	Coordination Ballot Received	Coordination Comment(s) Received
00601054	Bruce Barrow	SCC14	301-493-4374 bbarrow@nist.gov	yes	-
00001000	Michelle Turner	SCC10	732-562-3825 m.d.turner@ieee.org	-	yes
00001001	Michelle Turner	Editorial	732-562-3825 m.d.turner@ieee.org	-	yes

Balloters

Number	Name	Phone / E-mail	Vote	T	E	Graphics	Status Notes	Interest Category
41371999	Gordon Antonello Wi-LAN Inc. 2891 Sunridge Way NE Calgary, Alberta T1Y 7K7 Canada	+1 (403) 207-6477 gantonello@wi-lan.com	Approve, no comments (Y)	-	-	-		Producer
06154470	Morris Balamut 13 Matawan Green Lane Matawan, NJ 07747 USA	732-566-3588 m.balamut@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
05587654	John Barr Motorola	847-576-8706 john.barr@motorola.com	Disapprove, comments	1	-	1		Producer

	1303 E. Algonquin Road, IL01/4th Schaumburg, IL 60196 USA		(N)					
07335656	Anader Benyamin-Seeyar Consultant to Harris Corporation 3 Hotel de Ville Dollard des Ormeaux, Quebec H9B 3G4 Canada	(514)421-8435 Anader.Benyamin@AdvantechAMT.com	Approve, no comments (Y)	1	-	-		User
01682194	Maurice Bizzarri Bizzarri Software 420 El Dorado Ave Palo Alto, California 94306-2421 USA	6505753694 bizzarri@well.com	Approve, no comments (Y)	-	-	-		General Interest
04503512	Ed Callaway Motorola 8000 W. Sunrise Blvd., MS 2141 Plantation, Florida 33322-8292 USA	954-723-8341 ed.callaway@motorola.com	Approve, no comments (Y)	-	-	-		General Interest
00812131	Naftali Chayat Alvarion 21a HaBarzel st. Tel Aviv 61131 Israel	+972-54-225549 naftali.chayat@alvarion.com	Disapprove, comments (N)	4	1	-		Producer
41437562	Remi Chayer Harris Corporation 3 Hotel de Ville Dollard-des-Ormeaux, Quebec H9B 3G4 Canada	1 (514) 421-8360 rchayer@harris.com	Approve, comments (Y1)	-	6	-		Producer
40237493	Keith Chow 28 Hawthorn Way Cambridge, Cams CB4 1AX UK	+44 (0)7796217543 chow.keith@computer.org	Approve, no comments (Y)	-	-	-		General Interest
40255444	Lim Christina The University of Melbourne 11 Lincoln Street Victoria, Victoria 3020 Australia	61-3-8344-6678 c.lim@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
03210820	Todor Cooklev Aware, Inc. 3685 Mt Diablo Blvd, suite 395 Lafayette, CA	781-687-0682 tcooklev@aware.com	Approve, no comments (Y)	-	-	-		General Interest

	94549 USA							
06503270	Jose Costa Nortel Networks 14 Ridgefield Crescent Nepean, Ontario K2H 6R9 Canada	613 763-7574 costa@nortelnetworks.com	Approve, no comments (Y)	-	-	-		Producer
41338009	Donald Cowick Sprint MS: KSOPKB0803 9300 Metcalf, Overland Park, Kansas 66210 USA	913-534-3396 donald.k.cowick@mail.sprint.com	-	-	-	-		General Interest
40199311	Thomas Dineen Dineen Consulting PO Box 361801 Milpitas, CA 95036 USA	(408) 956-0539 tdineen@ix.netcom.com	Approve, no comments (Y)	-	-	-		Producer
08972887	Dr. Sourav Dutta V S N L 16th Floor, Internet HQ, VSB, M G Road, Fort Mumbai, MH 400001 INDIA	+91 22 267-4269 s.dutta@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
05472527	Richard Eckard Verizon Laboratories 40 Sylvan Road Waltham, MA 02451 USA	781-466-2780 dick.eckard@verizon.com	-	-	-	-		User
40263910	Dominic Espejo Caltrans District 7 120 S. Spring St. MS15 Los Angeles, CA 90012 USA	213-897-6623 despejo@ieee.org	Approve, no comments (Y)	-	-	-		Government
06810238	Michael Fischer Intersil Corporation 4242-3 Medical Drive San Antonio, TX 78229 USA	+1-210-614-4096 mfischer@choicemicro.com	-	-	-	-		Producer
03533247	Keng Fong Ralink Technology 20300 Stevens Creek Cupertino, CA 95014 USA	(408) 725-8070 x 18 fong@ieee.org	Approve, no comments (Y)	-	-	-		Producer
08518995	Avraham Freedman Hexagon System	+972-3-5101128 avif@hexagonltd.com	Approve, comments	-	1	1		General Interest

	Engineering Ltd 2 Kaufman st. Tel-Aviv, Israel 68012 Israel		(Y1)					
40148012	Mike Geipel REMEC Broadband Wireless 1600 East Parham Road Glen Allen, Virginia 23228 USA	804-864-4125 geipel@ieee.org	Disapprove, comments (N)	1	-	-		Producer
41414896	Andrew Germano Tantivy Communications 1450 S. Babcock Street Melbourne, Florida 32901 USA	321-956-8846 agermano@tantivy.com	-	-	-	-		General Interest
01883768	James Gilb Appairent Technologies 9921 Carmel Mountain Rd, #247 San Diego, CA 92129 USA	858-538-3903 gilb@ieee.org	Approve, no comments (Y)	-	-	-		Producer
41361934	Mariana Goldhamer Alvarion 21, Ha Barzel St. Tel Aviv, n.a. 69710 Israel	+972-54-22 55 48 marianna.goldhammer@alvarion.com	Disapprove, comments (N)	1	-	1		Producer
00028464	Qiang Guo Motorola, Inc. 600 North U.S. Highway 45 Libertyville, Illinois 60048 U.S.A.	(847) 523-3217 qa3565@email.mot.com	Approve, no comments (Y)	-	-	-		General Interest
40306847	Simon Harrison Red-M (Communications) Ltd Neptune House, Mercury Park Wycombe Lane, Wooburn Green, Buckinghamshire HP10 0HH UK	+44 (0) 1628 819604 simon.harrison@red-m.com	Approve, no comments (Y)	-	-	-		General Interest
01670801	Robert Heile Wireless Communications Consulting 11 Louis Road	508-222-1393 bheile@ieee.org	Approve, no comments (Y)	-	-	-		General Interest

	Attleboro, MA 02703 USA							
41242888	Andreas Jochen Holtmann Deutsche Bank S.A.E. Via Interpolar s/n Sant Cugat, Barcelona 08190 Spain	+34-93-851-8605 andreas_holtmann@yahoo.de	Abstain for lack of time (A1)	-	-	-		User
08124661	Osamu Ishida NTT 1-1, Hikari-no-oka Yokosuka, Kanagawa 239-0847 Japan	+81-468-59-3445 ishida@exa.onlab.ntt.co.jp	-	-	-	-		User
06710792	Raj Jain Nayna Networks, Inc. 481 Sycamore Dr Milpitas, CA 95035 United States	(408) 956-8000 x309 raj@nayna.com	Approve, no comments (Y)	-	-	-		User
01556620	Hamadi Jamali DST 983 Johnson st Redwood City, CA 94061 USA	(650)367-7697 hjamali@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
41448969	Tal Kaitz alvarion 21 a Habarze st. Tel Aviv, Israel 69710 Israel	972-3-6456273 tal.kaitz@alvarion.com	Disapprove, comments (N)	-	-	-	negative ballot without comment	Producer
40357068	Stuart Kerry Philips Semiconductors Inc. 1109 McKay Drive, MS 48 SJ San Jose, CA 95130-1706 USA	408-474-7356 stuartk@ieee.org	Approve, no comments (Y)	-	-	-		Producer
05995253	Brian Kiernan InterDigital Communications Corp. 781 Third Avenue King of Prussia, PA 19406 USA	610-878-5637 brian.kiernan@interdigital.com	Approve, no comments (Y)	-	-	-		General Interest
41335428	Jerome Krinock Radia Communications 275 N. Mathilda, Suite A Sunnyvale, CA 94086	408-830-9726 ext 239 jkrinock@radiacommunications.com	Approve, no comments (Y)	-	-	-		Producer

	USA							
41283461	Jonathan Labs Wavesat Wireless, Inc 4600 rue Cousens Ville St-Laurent, Quebec H4S 1X3 Canada	(514)956-6325 jlabs@wavesat.com	Approve, comments (Y1)	1	-	1		General Interest
08108896	Yeou-Song Lee Anritsu 5734 Tan Oak Drive Fremont, CA 94555 U.S.A.	408-778-2000 ext. 4976 brian.lee@ieee.org	Approve, no comments (Y)	-	-	-		Producer
06426456	John Lepore Technology Service Corp. 80 M. Street SE, Suite 640 Washington, D.C. 20003 USA	202-554-4172 Ext. 23 jlepore@tscwo.com	Approve, comments (Y1)	-	1	-		General Interest
05845615	Gregory Luri CITY OF ST. CHARLES-ILLINOIS 2 East Main Street St. Charles, IL 60174-1984 USA	630-377-4475 gluri@ci.st-charles.il.us	Approve, no comments (Y)	-	-	-		User
40354777	Yuan Ma GEMS 3200 N. Grandview Blvd. Waukesha, WI 53188 USA	262 521 6223 YUAN.MA@med.ge.com	Abstain for lack of expertise (A2)	-	-	-		User
06760854	J. Scott Marin 131 Skyline Drive Murphy, Texas 75094 United States	972-516-5158 smarin@ix.netcom.com	-	-	-	-		General Interest
08122103	Roger Marks NIST 325 Broadway, MC 813.00 Boulder, CO 80305 USA	+1 303 497 3037 r.b.marks@ieee.org	Approve, comments (Y1)	1	-	1		Government
40219720	Kevin Marquess Hyper Corporation 1279 Quarry Lane, Suite B Pleasanton, CA 94566-8499 USA	+1.925.549.7601 kevin.marquess@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
08940611	Peter Martini	49228734571	Approve,	-	-	-		General

	University of Bonn, Dept. of CS IV Roemerstr. 164 Bonn, none 53117 Germany	martini@cs.uni-bonn.de	no comments (Y)					Interest
40183512	Kyle Maus AITG 6007 N. Sheridan Rd., #28J Chicago, IL 60660 US	312-371-9727 sargon@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
40066042	Patrick McCaughey Renaissance Doors and Windows 130 N. Gilbert Fullerton, California 92633 USA	(714) 521-5747 pmccaughey@irishabroad.com	Abstain for lack of expertise (A2)	-	-	-		User
07871098	Mehrdad Mehdizadeh DuPont Co. Mail Stop E357/105, PO Box 80357 Wilmington, DE 19880-0357 USA	302-695-8623 mehrdad.mehdizadeh@usa.dupont.com	Approve, no comments (Y)	-	-	-		User
07446628	Michael Newman CSI Telecommunications Engrs. 1700 California Street, Suite 420 San Francisco, CA 94109 USA	415-751-8845 miken@csitele.com	Approve, no comments (Y)	-	-	-		General Interest
07858459	Paul Nikolich Chair, IEEE802 LAN/MAN Standards Project 18 Bishops Lane Lynnfield, MA 01940 usa	857-205-0050 p.nikolich@ieee.org	Disapprove, comments (N)	1	-	-		General Interest
05280607	Mike Paff Radia Communications 275 N. Mathilda Ave. Sunnyvale, CA 94086 USA	408 830 9726 x243 mpaff@radiacommunications.com	Approve, no comments (Y)	-	-	-		Producer
07022429	Roger Pandanda MCS Corporation Box 20451 Palo ALto, CA 20451 USA	650-618-1786 rogerp@ieee.org	Approve, no comments (Y)	-	-	-		General Interest

00353235	Subbu Ponnuswamy Self 1005 Blue Ravine Road, #926 Folsom, CA 95630 USA	916-425-1276 subbu@acm.org	Approve, no comments (Y)	-	-	-		General Interest
40266494	Eugene Robinson E.A. Robinson Consulting Inc. 1200 Lake Point Circle McKinney, Texas 75070 USA	972 529-6395 rob1200@aol.com	Approve, no comments (Y)	-	-	-		General Interest
01378470	Walt Roehr TNC 11317 sout shore rd reston, va 20190 usa	703-435-1787 w.c.roehr@ieee.org	-	-	-	-		General Interest
41413768	Shane Rogers Wi-LAN Inc. 2891 Sunridge Way N.E. Calgary, AB T1Y 7K7 Canada	403 207-6355 srogers@wi-lan.com	Approve, no comments (Y)	-	-	-		Producer
21770065	Thomas Ruf SysKonnect Siemensstrasse 23 Ettlingen, BW 76275 Germany	+49 7243 502 324 truf@syskonnect.de	Approve, no comments (Y)	-	-	-		General Interest
40239981	Thomas Siep Bluetooth SIG, Inc. m/s 365, 1802 Pleasant Valley Dr, Suite 100 Garland, TX 75040 USA	+1 972 495 5491 tom.siep@ieee.org	-	-	-	-		User
40286647	Manoneet Singh Radia Communications 275 N Mathilda Ave Suite A Sunnyvale, CA 94086 USA	(408) 870 9726 x 244 msingh@radiacommunications.com	Approve, no comments (Y)	-	-	-		Producer
41392686	Kenneth Stanwood Ensemble Communications 9890 Towne Centre Dr San Diego, CA 92009 USA	(858) 404 6559 ken@ensemble.com	Disapprove, comments (N)	1	-	1		Producer

00832790	Paul Struhsaker	972-516-1254 paul@razetechnologies.com	Approve, no comments (Y)	-	-	-		Producer
41279013	Shawn Taylor Wi-LAN 2891 Sunridge Way NE Calgary, Alberta T2E 4A8 Canada	403-207-6491 staylor@wi-lan.com	Disapprove, comments (N)	2	-	-		Producer
41452605	David Trinkwon Medley Systems Ltd 8 Blenheim Road Maidenhead, Berkshire SL6 5HD United Kingdom	650 245 5650 trinkwon@compuserve.com	Disapprove, comments (N)	-	-	-	negative ballot without comment	General Interest
03239332	Joan Viaplana RETEVISION JOSEP PLA, 15 ARENYS DE MUNT, BARCELONA 08358 SPAIN	+34670221398 jviaplana@acm.org	Approve, no comments (Y)	-	-	-		General Interest
41328136	LEI WANG Wi-LAN Inc. 2891 Sunridge Way, N.E. Calgary, Alberta T1Y 7K7 Canada	(403)204-3288 leiw@wi-lan.com	Disapprove, comments (N)	4	3	-		General Interest
41387608	Stanley Wang Ensemble Communications, Inc. 13268 Larkfield Court San Diego, CA 92130 USA	+1 (858) 526-7265 Stanley@reddotwireless.com	Approve, no comments (Y)	-	-	-		Producer
07368616	Jay Warrior Agilent Technologies 3500, Deer Creek Road Palo Alto, CA 94304 USA	650-485-2086 jay_warrior@agilent.com	Abstain for lack of time (A1)	-	-	-		General Interest
02982643	John Westmoreland LSI Logic Corporation 1778 McCarthy Blvd. Milpitas, CA 95035 USA	408-532-6234 john.westmoreland@lsil.com	Approve, no comments (Y)	-	-	-		User
07124290	Paul Yang OTC Wireless 10176 English Oak Way Cupertino, CA	510-490-8288 x239 pyang@otcwireless.com	-	-	-	-		General Interest

	95014-5653 USA							
41446880	Vladimir Yanover Alvarion Ltd. 22a Habarzel Str. Tel-Aviv, Sorry, there are no states or provinces in Israel 32176 Israel	+972-36457834 vladimir.yanover@alvarion.com	Disapprove, comments (N)	1	-	1		Producer
40262090	Huanchun Ye Beamreach Networks 755 North Mathilda Ave Sunnyvale, CA 94086 USA	408-869-8748 hcye@ieee.org	Abstain for lack of time (A1)	-	-	-		User
40354434	Jung Yee IceFyre Semiconductor 411 Legget Drive, Suite 300 kanata, Ontario K2K 2C9 Canada	613.599.3000 x226 jyee@icefyre.com	Abstain for lack of time (A1)	-	-	-		Producer
05907266	Oren Yuen 1504 Steinhart Ave Redondo Beach, CA 90278 USA	310-372-9334 oren.yuen@ieee.org	Approve, no comments (Y)	-	-	-		User
41392758	micheal chukwu Elect Elect eng. unizik, Awka Awka, Anambra State pmb5025 Nigeria	082228948 shawnweb@onebox.com	Approve, comments (Y1)	-	-	-	Approve, comments without comment	User
04804282	carl scarpa Hitachi america 307 college road east princeton , nj 08540 usa	609-945-0117 CScarpa@siriusradio.com	Abstain, other (A3)	-	-	-	Abstain, other without comment	General Interest
41249250	Nico van Waes Nokia 313 Fairchild Dr. Mountain View, CA 94043 USA	650 625 2201 nico.vanwaes@nokia.com	Disapprove, comments (N)	2	-	2		Producer
41435547	Cor van de Water Agere Systems Zadelstede 1-10 Nieuwegein, Utrecht 3435EA Netherlands	+31 30 609 7563 water@agere.com	Approve, no comments (Y)	-	-	-		Producer
			Comment Totals *	21	12	9		

(*) *You have at least these many comments: each unstructured binary file (i.e., Word) is counted as a single G*

file, which may consist of one or hundreds of individual T and E comments.

Summary of Eligible Voters by Interest Category

Interest Category	Affirmative(s)	Negative(s)	Abstention(s)	Not Returned	Total
User	7	0	4	3	14
Producer	15	9	1	1	26
General Interest	24	3	2	5	34
Government	2	0	0	0	2
Voting Tally	**48**	**12**	**7**	**9**	**76**

Abstention details:	4 for lack of time (A1)	2 for lack of expertise (A2)	1 for other reasons (A3)

Ballot Summary

P802.16a/D5 Recirculation
Closing date: 2002-10-11

This is a recirculation ballot. The report collates the results from the following groups: 0000224 0000365.

1. This ballot has met the 75% returned ballot requirement.

```
    76 eligible people in this ballot group.


    48 affirmative votes
    12 negative votes
     7 abstention votes
=====
    67 votes received =  88% returned
                         10% abstention
```

2. The 75% affirmation requirement is being met.

```
    48 affirmative votes
    12 negative votes
=====
    60 votes =  80% affirmative
```

Ballot Details

Coordination Responses Only

IEEE/Coord Number	Name	Role	Phone / E-mail	Coordination Ballot Received	Coordination Comment(s) Received
00601054	Bruce Barrow	SCC14	301-493-4374 bbarrow@nist.gov	yes	-
00001000	Michelle Turner	SCC10	732-562-3825 m.d.turner@ieee.org	-	yes
00001001	Michelle Turner	Editorial	732-562-3825 m.d.turner@ieee.org	-	yes

Balloters

Number	Name	Phone / E-mail	Vote	T	E	Graphics	Status Notes	Interest Category
41371999	Gordon Antonello Wi-LAN Inc. 2891 Sunridge Way NE Calgary, Alberta T1Y 7K7 Canada	+1 (403) 207-6477 gantonello@wi-lan.com	Approve, no comments (Y)	-	-	-		Producer
06154470	Morris Balamut 13 Matawan Green Lane Matawan, NJ 07747 USA	732-566-3588 m.balamut@ieee.org	Approve, no comments (Y)	-	-	-		General Interest

05587654	John Barr Motorola 1303 E. Algonquin Road, IL01/4th Schaumburg, IL 60196 USA	847-576-8706 john.barr@motorola.com	Disapprove, comments (N)*	3	-	1		Producer
07335656	Anader Benyamin-Seeyar Consultant to Harris Corporation 3 Hotel de Ville Dollard des Ormeaux, Quebec H9B 3G4 Canada	(514)421-8435 Anader.Benyamin@AdvantechAMT.com	Disapprove, comments (N)*	2	-	1		User
01682194	Maurice Bizzarri Bizzarri Software 420 El Dorado Ave Palo Alto, California 94306-2421 USA	6505753694 bizzarri@well.com	Approve, no comments (Y)	-	-	-		General Interest
04503512	Ed Callaway Motorola 8000 W. Sunrise Blvd., MS 2141 Plantation, Florida 33322-8292 USA	954-723-8341 ed.callaway@motorola.com	Approve, no comments (Y)	-	-	-		General Interest
00812131	Naftali Chayat Alvarion 21a HaBarzel st. Tel Aviv 61131 Israel	+972-54-225549 naftali.chayat@alvarion.com	Disapprove, comments (N)	4	1	-		Producer
41437562	Remi Chayer Harris Corporation 3 Hotel de Ville Dollard-des-Ormeaux, Quebec H9B 3G4 Canada	1 (514) 421-8360 rchayer@harris.com	Approve, comments (Y1)	-	6	-		Producer
40237493	Keith Chow 28 Hawthorn Way Cambridge, Cams CB4 1AX UK	+44 (0)7796217543 chow.keith@computer.org	Approve, no comments (Y)	-	-	-		General Interest
40255444	Lim Christina The University of Melbourne 11 Lincoln Street Victoria, Victoria 3020 Australia	61-3-8344-6678 c.lim@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
03210820	Todor Cooklev Aware, Inc. 3685 Mt Diablo Blvd,	781-687-0682 tcooklev@aware.com	Approve, no comments	-	-	-		General Interest

	suite 395 Lafayette, CA 94549 USA		(Y)					
06503270	Jose Costa Nortel Networks 14 Ridgefield Crescent Nepean, Ontario K2H 6R9 Canada	613 763-7574 costa@nortelnetworks.com	Approve, no comments (Y)	-	-	-		Producer
41338009	Donald Cowick Sprint MS: KSOPKB0803 9300 Metcalf, Overland Park, Kansas 66210 USA	913-534-3396 donald.k.cowick@mail.sprint.com	-	-	-	-		General Interest
40199311	Thomas Dineen Dineen Consulting PO Box 361801 Milpitas, CA 95036 USA	(408) 956-0539 tdineen@ix.netcom.com	Approve, no comments (Y)	-	-	-		Producer
08972887	Dr. Sourav Dutta V S N L 16th Floor, Internet HQ, VSB, M G Road, Fort Mumbai, MH 400001 INDIA	+91 22 267-4269 s.dutta@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
05472527	Richard Eckard Verizon Laboratories 40 Sylvan Road Waltham, MA 02451 USA	781-466-2780 dick.eckard@verizon.com	-	-	-	-		User
40263910	Dominic Espejo Caltrans District 7 120 S. Spring St. MS15 Los Angeles, CA 90012 USA	213-897-6623 despejo@ieee.org	Approve, no comments (Y)	-	-	-		Government
06810238	Michael Fischer Intersil Corporation 4242-3 Medical Drive San Antonio, TX 78229 USA	+1-210-614-4096 mfischer@choicemicro.com	-	-	-	-		Producer
03533247	Keng Fong Ralink Technology 20300 Stevens Creek Cupertino, CA 95014 USA	(408) 725-8070 x 18 fong@ieee.org	Approve, no comments (Y)	-	-	-		Producer

08518995	Avraham Freedman Hexagon System Engineering Ltd 2 Kaufman st. Tel-Aviv, Israel 68012 Israel	+972-3-5101128 avif@hexagonltd.com	Approve, comments (Y1)	-	1	1		General Interest
40148012	Mike Geipel REMEC Broadband Wireless 1600 East Parham Road Glen Allen, Virginia 23228 USA	804-864-4125 geipel@ieee.org	Disapprove, comments (N)	1	-	-		Producer
41414896	Andrew Germano Tantivy Communications 1450 S. Babcock Street Melbourne, Florida 32901 USA	321-956-8846 agermano@tantivy.com	-	-	-	-		General Interest
01883768	James Gilb Appairent Technologies 9921 Carmel Mountain Rd, #247 San Diego, CA 92129 USA	858-538-3903 gilb@ieee.org	Approve, no comments (Y)	-	-	-		Producer
41361934	Mariana Goldhamer Alvarion 21, Ha Barzel St. Tel Aviv, n.a. 69710 Israel	+972-54-22 55 48 marianna.goldhammer@alvarion.com	Disapprove, comments (N)*	2	-	2		Producer
00028464	Qiang Guo Motorola, Inc. 600 North U.S. Highway 45 Libertyville, Illinois 60048 U.S.A.	(847) 523-3217 qa3565@email.mot.com	Approve, no comments (Y)	-	-	-		General Interest
40306847	Simon Harrison Red-M (Communications) Ltd Neptune House, Mercury Park Wycombe Lane, Wooburn Green, Buckinghamshire HP10 0HH UK	+44 (0) 1628 819604 simon.harrison@red-m.com	Approve, no comments (Y)*	-	-	-		General Interest
01670801	Robert Heile Wireless Communications	508-222-1393 bheile@ieee.org	Approve, no comments	-	-	-		General Interest

	Consulting 11 Louis Road Attleboro, MA 02703 USA		(Y)					
41242888	Andreas Jochen Holtmann Deutsche Bank S.A.E. Via Interpolar s/n Sant Cugat, Barcelona 08190 Spain	+34-93-851-8605 andreas_holtmann@yahoo.de	Abstain for lack of time (A1)	-	-	-		User
08124661	Osamu Ishida NTT 1-1, Hikari-no-oka Yokosuka, Kanagawa 239-0847 Japan	+81-468-59-3445 ishida@exa.onlab.ntt.co.jp	-	-	-	-		User
06710792	Raj Jain Nayna Networks, Inc. 481 Sycamore Dr Milpitas, CA 95035 United States	(408) 956-8000 x309 raj@nayna.com	Approve, no comments (Y)	-	-	-		User
01556620	Hamadi Jamali DST 983 Johnson st Redwood City, CA 94061 USA	(650)367-7697 hjamali@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
41448969	Tal Kaitz alvarion 21 a Habarze st. Tel Aviv, Israel 69710 Israel	972-3-6456273 tal.kaitz@alvarion.com	Disapprove, comments (N)*	1	-	1		Producer
40357068	Stuart Kerry Philips Semiconductors Inc. 1109 McKay Drive, MS 48 SJ San Jose, CA 95130-1706 USA	408-474-7356 stuartk@ieee.org	Approve, no comments (Y)*	-	-	-		Producer
05995253	Brian Kiernan InterDigital Communications Corp. 781 Third Avenue King of Prussia, PA 19406 USA	610-878-5637 brian.kiernan@interdigital.com	Approve, no comments (Y)	-	-	-		General Interest
41335428	Jerome Krinock Radia Communications 275 N. Mathilda, Suite A	408-830-9726 ext 239 jkrinock@radiacommunications.com	Approve, comments (Y1)*	-	-	-	Approve, comments without comment	Producer

	Sunnyvale, CA 94086 USA							
41283461	Jonathan Labs Wavesat Wireless, Inc 4600 rue Cousens Ville St-Laurent, Quebec H4S 1X3 Canada	(514)956-6325 jlabs@wavesat.com	Approve, comments (Y1)	1	-	1		General Interest
08108896	Yeou-Song Lee Anritsu 5734 Tan Oak Drive Fremont, CA 94555 U.S.A.	408-778-2000 ext. 4976 brian.lee@ieee.org	Approve, no comments (Y)	-	-	-		Producer
06426456	John Lepore Technology Service Corp. 80 M. Street SE, Suite 640 Washington, D.C. 20003 USA	202-554-4172 Ext. 23 jlepore@tscwo.com	Approve, comments (Y1)	-	1	-		General Interest
05845615	Gregory Luri CITY OF ST. CHARLES-ILLINOIS 2 East Main Street St. Charles, IL 60174-1984 USA	630-377-4475 gluri@ci.st-charles.il.us	Approve, no comments (Y)*	-	-	-		User
40354777	Yuan Ma GEMS 3200 N. Grandview Blvd. Waukesha, WI 53188 USA	262 521 6223 YUAN.MA@med.ge.com	Abstain for lack of expertise (A2)	-	-	-		User
06760854	J. Scott Marin 131 Skyline Drive Murphy, Texas 75094 United States	972-516-5158 smarin@ix.netcom.com	-	-	-	-		General Interest
08122103	Roger Marks NIST 325 Broadway, MC 813.00 Boulder, CO 80305 USA	+1 303 497 3037 r.b.marks@ieee.org	Approve, no comments (Y)*	1	-	1		Government
40219720	Kevin Marquess Hyper Corporation 1279 Quarry Lane, Suite B Pleasanton, CA 94566-8499 USA	+1.925.549.7601 kevin.marquess@ieee.org	Approve, no comments (Y)	-	-	-		General Interest

08940611	Peter Martini University of Bonn, Dept. of CS IV Roemerstr. 164 Bonn, none 53117 Germany	49228734571 martini@cs.uni-bonn.de	Approve, no comments (Y)	-	-	-		General Interest
40183512	Kyle Maus AITG 6007 N. Sheridan Rd., #28J Chicago, IL 60660 US	312-371-9727 sargon@ieee.org	Approve, no comments (Y)	-	-	-		General Interest
40066042	Patrick McCaughey Renaissance Doors and Windows 130 N. Gilbert Fullerton, California 92633 USA	(714) 521-5747 pmccaughey@irishabroad.com	Abstain for lack of expertise (A2)	-	-	-		User
07871098	Mehrdad Mehdizadeh DuPont Co. Mail Stop E357/105, PO Box 80357 Wilmington, DE 19880-0357 USA	302-695-8623 mehrdad.mehdizadeh@usa.dupont.com	Approve, no comments (Y)	-	-	-		User
07446628	Michael Newman CSI Telecommunications Engrs. 1700 California Street, Suite 420 San Francisco, CA 94109 USA	415-751-8845 miken@csitele.com	Approve, no comments (Y)*	-	-	-		General Interest
07858459	Paul Nikolich Chair, IEEE802 LAN/MAN Standards Project 18 Bishops Lane Lynnfield, MA 01940 usa	857-205-0050 p.nikolich@ieee.org	Disapprove, comments (N)	1	-	-		General Interest
05280607	Mike Paff Radia Communications 275 N. Mathilda Ave. Sunnyvale, CA 94086 USA	408 830 9726 x243 mpaff@radiacommunications.com	Approve, no comments (Y)	-	-	-		Producer
07022429	Roger Pandanda MCS Corporation Box 20451 Palo ALto, CA 20451	650-618-1786 rogerp@ieee.org	Approve, no comments (Y)	-	-	-		General Interest

	USA							
00353235	Subbu Ponnuswamy Self 1005 Blue Ravine Road, #926 Folsom, CA 95630 USA	916-425-1276 subbu@acm.org	Approve, no comments (Y)	-	-	-		General Interest
40266494	Eugene Robinson E.A. Robinson Consulting Inc. 1200 Lake Point Circle McKinney, Texas 75070 USA	972 529-6395 rob1200@aol.com	Approve, no comments (Y)	-	-	-		General Interest
01378470	Walt Roehr TNC 11317 sout shore rd reston, va 20190 usa	703-435-1787 w.c.roehr@ieee.org	-	-	-	-		General Interest
41413768	Shane Rogers Wi-LAN Inc. 2891 Sunridge Way N.E. Calgary, AB T1Y 7K7 Canada	403 207-6355 srogers@wi-lan.com	Approve, no comments (Y)	-	-	-		Producer
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40239981	Thomas Siep Bluetooth SIG, Inc. m/s 365, 1802 Pleasant Valley Dr, Suite 100 Garland, TX 75040 USA	+1 972 495 5491 tom.siep@ieee.org	-	-	-	-		User
40286647	Manoneet Singh Radia Communications 275 N Mathilda Ave Suite A Sunnyvale, CA 94086 USA	(408) 870 9726 x 244 msingh@radiacommunications.com	Approve, no comments (Y)	-	-	-		Producer
41392686	Kenneth Stanwood Ensemble Communications 9890 Towne Centre Dr San Diego, CA 92009	(858) 404 6559 ken@ensemble.com	Approve, no comments (Y)*	1	-	1		Producer

	USA							
00832790	Paul Struhsaker	972-516-1254 paul@razetechnologies.com	Approve, no comments (Y)	-	-	-		Producer
41279013	Shawn Taylor Wi-LAN 2891 Sunridge Way NE Calgary, Alberta T2E 4A8 Canada	403-207-6491 staylor@wi-lan.com	Disapprove, comments (N)	2	-	-		Producer
41452605	David Trinkwon Medley Systems Ltd 8 Blenheim Road Maidenhead, Berkshire SL6 5HD United Kingdom	650 245 5650 trinkwon@compuserve.com	Disapprove, comments (N)	-	-	-	negative ballot without comment	General Interest
03239332	Joan Viaplana RETEVISION JOSEP PLA, 15 ARENYS DE MUNT, BARCELONA 08358 SPAIN	+34670221398 jviaplana@acm.org	Approve, no comments (Y)	-	-	-		General Interest
41328136	LEI WANG Wi-LAN Inc. 2891 Sunridge Way, N.E. Calgary, Alberta T1Y 7K7 Canada	(403)204-3288 leiw@wi-lan.com	Disapprove, comments (N)	4	3	-		General Interest
41387608	Stanley Wang Ensemble Communications, Inc. 13268 Larkfield Court San Diego, CA 92130 USA	+1 (858) 526-7265 Stanley@reddotwireless.com	Approve, no comments (Y)	-	-	-		Producer
07368616	Jay Warrior Agilent Technologies 3500, Deer Creek Road Palo Alto, CA 94304 USA	650-485-2086 jay_warrior@agilent.com	Abstain for lack of time (A1)	-	-	-		General Interest
02982643	John Westmoreland LSI Logic Corporation 1778 McCarthy Blvd. Milpitas, CA 95035 USA	408-532-6234 john.westmoreland@lsil.com	Approve, no comments (Y)	-	-	-		User
07124290	Paul Yang OTC Wireless 10176 English Oak	510-490-8288 x239 pyang@otcwireless.com	-	-	-	-		General Interest

	Way Cupertino, CA 95014-5653 USA							
41446880	Vladimir Yanover Alvarion Ltd. 22a Habarzel Str. Tel-Aviv, Sorry, there are no states or provinces in Israel 32176 Israel	+972-36457834 vladimir.yanover@alvarion.com	Disapprove, comments (N)*	2	-	2		Producer
40262090	Huanchun Ye Beamreach Networks 755 North Mathilda Ave Sunnyvale, CA 94086 USA	408-869-8748 hcye@ieee.org	Abstain for lack of time (A1)	-	-	-		User
40354434	Jung Yee IceFyre Semiconductor 411 Legget Drive, Suite 300 kanata, Ontario K2K 2C9 Canada	613.599.3000 x226 jyee@icefyre.com	Abstain for lack of time (A1)	-	-	-		Producer
05907266	Oren Yuen 1504 Steinhart Ave Redondo Beach, CA 90278 USA	310-372-9334 oren.yuen@ieee.org	Approve, no comments (Y)	-	-	-		User
41392758	micheal chukwu Elect Elect eng. unizik, Awka Awka, Anambra State pmb5025 Nigeria	082228948 shawnweb@onebox.com	Approve, comments (Y1)	-	-	-	Approve, comments without comment	User
04804282	carl scarpa Hitachi america 307 college road east princeton , nj 08540 usa	609-945-0117 CScarpa@siriusradio.com	Abstain, other (A3)	-	-	-	Abstain, other without comment	General Interest
41249250	Nico van Waes Nokia 313 Fairchild Dr. Mountain View, CA 94043 USA	650 625 2201 nico.vanwaes@nokia.com	Disapprove, comments (N)*	3	-	3		Producer
41435547	Cor van de Water Agere Systems Zadelstede 1-10 Nieuwegein, Utrecht 3435EA Netherlands	+31 30 609 7563 water@agere.com	Approve, no comments (Y)	-	-	-		Producer

Comment Totals *	28	12	14

(*) *You have at least these many comments: each unstructured binary file (i.e., Word) is counted as a single G file, which may consist of one or hundreds of individual T and E comments.*

***** This balloter cast this ballot in the current circulation of this recirc ballot.

Summary of Eligible Voters by Interest Category

Interest Category	Affirmative(s)	Negative(s)	Abstention(s)	Not Returned	Total
User	6	1	4	3	14
Producer	16	8	1	1	26
General Interest	24	3	2	5	34
Government	2	0	0	0	2
Voting Tally	**48**	**12**	**7**	**9**	**76**

Abstention details:	4 for lack of time (A1)	2 for lack of expertise (A2)	1 for other reasons (A3)

Document under Review: 802.16a/D5 Ballot Number: 802.16a Comment Date

Comment # 330 Submitted by: Tal Kaitz Member 2002/10/10

Comment Type Technical, Binding Starting Page # 10 Starting Line # Fig/Table# Section

Related to comment 11 (and also to comments 162, 166, 167)

The 256 OFDM system can be greatly improved by adding an optional sub-channelization support in the UL.
Sub-channelization has the following advantages:

a. It reduces data granularity.
b. It reduces overheads due to preambles.
c. It allows power concentration in increased link budget in the UL.

The proposed scheme fits naturally into the existing OFDM mode and is completely interoperable with it. This scheme was already adopted by HiperMAN.

During the comment resolution process, the subchannelization-related comments did not gain the required 75 % support. In my view the technical arguments against subchannelization were not justified. Some of these arguments are discussed below.

a. High degree of UL synchronization is required:

The proposed sub-subchannelization scheme is inherently robust to synchronization errors. In the proposed scheme, the subcarriers are arranged in clusters of 12 or 13. When frequency errors are present some inter-carrier interference is introduced. Because of the clustered allocation, only the clusters' edges interact and the overall inter subchannel interference is small.
In fact, the proposed scheme is more robust to frequency offsets than the 2K OFDMA. This is due to:

1. The carrier allocation. The 2K OFDMA uses a permutation approach in which subcarriers form different sub-channel are adjacent in frequency. Thus the inter-subchannel interference is much more severe.
2. The subcarrier spacing. The 2K OFDMA systems employ a much narrower subcarriers spacing than that of the 256 OFDM systems. For the same frequency error in Hz, the interference in the 2K system is much higher.

b. Due to shorter block sizes the Coding gain is reduced
.
This is only partly true. In some case the coding loss may be up to 1.5dB. However:

1. Using shorter block is one of the motivations of introducing subchannelization
2. The loss is well compensated by the 6dB power concentration gain.

c. Loss of estimation accuracy

The same estimation techniques can be used for both the OFDM and subchannelization modes. The estimation accuracy is expected to be the same.

d. Not enough frequency diversity.

The clustered approach was selected as a compromise between frequency diversity and robustness to frequency errors. The clusters are spread over the entire bandwidth. The loss in the frequency diversity is small.
It is true that one can obtain pathological channel responses for which the entire subchannel is faded. For instance, the channel 1+z-5, has notches at a period of 256/5=50 subcarriers, and a single subchannel is completely faded.
In such rare cases, the dynamics at the MAC level will insure that the SS sees this channel only for 25% of the time.

e. Not enough pilots

There are only 2 pilots per sub-channel. From a technical perspective it would be advantageous to increase the number of pilots. This can be accomplished by increasing the total number of subcarriers (say from 200 to 208 giving 4 pilots per subchannel). This will increase the occupied bandwidth by a small fraction.
However, to align with the existing OFDM mode the number of subcarreris was not increased.
To operate with a small number of pilots the BS can:
1. Allocate only short bursts, in which phase tracking is less important. (Not enough time for phase drift accumulation).
2. Use decision aided techniques in which no pilot subcarriers are necessary.

Suggested Remedy

copied from 42r3 comment 166.

Supporting subchannelization requires the following changes:
a. Divide the channel into sub-channels.
b. Change the UL map to support Subchannelization. The approach here was proposed by Nico and is similar to that of HiperMAN. A new Subchannelization_IE is defined. This element defines a region in the UL for which subchannelization is

employed. The element also defines how many subchannelization UL map elements are to follow.
c. Change the FEC mechanism to CC only for subchannelization. No change when subchannelization is not employed. The motivation is that CC code work better for small block sizes than CC+RS.

a. Divide the channel into subchannels

page 143:
"
When subchannelization is employed, the channel is dived into subchannels as shon in table 116ab:

table 116ab

Subchannel number:	Allocated frequency offset indices of carriers
1:	{-100,…,-89},{-50,...,-39},{1,...13},{51,...,63}
2:	{-88,…,-76},{-38,...,-26},{14,...,25},{64,...,75}
3:	{-75,…,-64},{-25,...,-14},{26,...,38},{76,...,88}
4:	{-63,…,-51},{-13,...,-1},{39,...,50},{89,...,100}

"
b. Change the UL map

Add section 8.4.4.3.5 UL MAP Subchannelization information element

Within a frame, the BS may allocate a portion of the UL allocations to sub-channelized traffic. The UL_subchannelization_IE implicitly indicates the start of the allocation and explicitly indicates the Duration and the Number of allocations. A SS not capable of subchannelization shall skip the number of allocation times 7 nibbles that follow, and resume interpreting the UL-MAP afterwards with the start of the next allocation Duration OFDM symbols after the last allocation ended.

Table 116az-OFDM UL subchannelization IE Format

Subchannelization_IE() {		
extended UIUC	4 bits	subchannelization = 0x03
Duration	12 bits	Cumulative duration of the allocations
Number of allocations	12 bits	Number of sub-channelized allocations following this IE
}		

….

A SS capable of sub-channelization shall decode the sub-channelized allocations, whereby the 12 bit Duration field in non-sub-channelized UL-MAP messages is replaced by a 3 bit Subchannel Index field and 5 bit Duration field as shown in Table

116at. A sub-channelized allocation shall start when all previous allocations to all allocated sub-channels have terminated.

In table 116at replace the 'Duration' row with:
"
else If (BS supports subchannelization and UIUC = 1,2 ,5:13) {
Subchannel Index 3 bits
0x0 Reserved
0x1 Sub-channel 1
0x2 Sub-channel 2
0x3 Sub-channel 3
0x4 Sub-channel 4
0x5 Sub-channel 1 and 3
0x6 Sub-channel 2 and 4
0x7 Reserved

Duration 5 bits
}
else
Duration 12 bits

}

"
Add
"
"If several consecutive allocations are granted to the same SS on same subchannels and UIUC values, then the SS shall use all allocations for sending a single PHY burst"

c. add CC only:

Add to Table 116ab 1/2, 10, 1,1,X1Y1

When sub-channelization is active (see 8.4.4.3.5), the FEC shall bypass the RS encoder and use the Overall Coding Rate as indicated in Table 116ac as CC Code Rate. The Uncoded Block Size and Coded Block size may be computed by dividing the values listed in Table 116ac by 4 and 2 for 1 and 2 sub-channel allocations respectively.

Resolution of Group **Decision of Group: Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The comment is similar to that of Comment 336, and the proposed remedy is identical. Please see Comment 336 comments for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 336 **Submitted by:** Marianna Goldhammer Member 2002/10/10

Comment Type Technical, Binding **Starting Page #** 143 **Starting Line #** **Fig/Table#** **Section** 8.4.3.

Enhance the OFDM 256FFT mode with optional sub-channelization, to improve both link-budget and granularity and align with BRAN-HM.

The comment resolution does not indicate the technical arguments against the OFDM channelization, that obiously introduces similar concepts with those implemented by the OFDMA PHY in uplink. The proposed mode has better granularity performance, better robustness to phase-noise, better frequency diversity than the optional 2k permutation mode.

To make more clear that the proposed enhancement is an option, the "optional" word has been inserted now.

Suggested Remedy

Supporting subchannelization requires the following: changes
a. Divide the channel into subchannels.
b. Change the UL map to support Subchannelization. The approach here was proposed by Nico and is similar to that of HiperMAN. A new Subchannelization_IE is defined. This element defines a region in the UL for which subchannelization is employed. The element also defines how many subchannelization UL map elements are to follow.
c. Change the FEC mechanism to CC only for subchannelization. No change when subchannelization is not employed. The motivation is that CC code work better for small block sizes than CC+RS.

a. Divide the channel into subchannels

page 143:
"
When subchannelization is employed, the channel is dived into subchannels as shon in table 116ab:

table 116ab

Subchannel number:	Allocated frequency offset indices of carriers
1:	{-100,…,-89},{-50,...,-39},{1,...13},{51,...,63}
2:	{-88,…,-76},{-38,...,-26},{14,...,25},{64,...,75}
3:	{-75,…,-64},{-25,...,-14},{26,...,38},{76,...,88}
4:	{-63,…,-51},{-13,...,-1},{39,...,50},{89,...,100}

"
b. Change the UL map

Add section 8.4.4.3.5 UL MAP Subchannelization information element

Within a frame, the BS may allocate a portion of the UL allocations to sub-channelized traffic. The UL_subchannelization_IE implicitly indicates the start of the allocation and explicitly indicates the Duration and the Number of allocations. A SS not capable of subchannelization shall skip the number of allocation times 7 nibbles that follow, and resume interpreting the UL-MAP afterwards with the start of the next allocation Duration OFDM symbols after the last allocation ended.

Table 116az-OFDM UL subchannelization IE Format

Subchannelization_IE() {		
extended UIUC	4 bits	subchannelization = 0x03
Duration	12 bits	Cumulative duration of the allocations
Number of allocations	12 bits	Number of sub-channelized allocations following this IE
}		

….

A SS capable of sub-channelization shall decode the sub-channelized allocations, whereby the 12 bit Duration field in non-sub-channelized UL-MAP messages is replaced by a 3 bit Subchannel Index field and 5 bit Duration field as shown in Table 116at. A sub-channelized allocation shall start when all previous allocations to all allocated sub-channels have terminated.

In table 116at replace the 'Duration' row with:

"

else If (BS supports subchannelization and UIUC = 1,2 ,5:13) {	
Subchannel Index	3 bits
0x0	Reserved
0x1	Sub-channel 1
0x2	Sub-channel 2
0x3	Sub-channel 3
0x4	Sub-channel 4
0x5	Sub-channel 1 and 3
0x6	Sub-channel 2 and 4
0x7	Reserved

Duration 5 bits
}
else
Duration 12 bits

}

"
Add
"
"If several consecutive allocations are granted to the same SS on same subchannels and UIUC values, then the SS shall use all allocations for sending a single PHY burst"

c. add CC only

Add to Table 116ab 1/2, 10, 1,1,X1Y1

When sub-channelization is active (see 8.4.4.3.5), the FEC shall bypass the RS encoder and use the Overall Coding Rate as indicated in Table 116ac as CC Code Rate. The Uncoded Block Size and Coded Block size may be computed by dividing the values listed in Table 116ac by 4 and 2 for 1 and 2 sub-channel allocations respectively.

Resolution of Group **Decision of Group: Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

Document C802.16a-02/90r7 encompass the suggested remedy with two exceptions: 1) It does not allow UIUC's 1 ("Initial ranging") and 2 ("REQ Region Full") to be used during subchannelization. 2) It does not contain the language: "If several consecutive allocations are granted to the same SS on same subchannels and UIUC values, then the SS shall use all allocations for sending a single PHY burst".

The language under point 1) above was omitted because it would allow a subscriber to demand service from a BS when its link

budget is sufficient only to allow the use of 1 subchannel. This would occur if the SS implements a PA which is economized to the point where it anticipates the gain achieved by subchannelization. This gain is in theory 6 dB (1/4th the bandwidth), but in practice will be less due to the effects of smaller possible FEC blocks, only 2 pilots per subchannel, and interference from the other subchannels.

Three problems would arise from this.

The first problem is that the peak UL data rate for an SS with such a link budget would be reduced by a factor of 4. The second problem is that it would force the BS scheduler to always provision UL allocations to SSs with such a link budget, instead of having the choice to optimize allocations over subchannels and full symbol allocations. Consider for example a 7 MHz licensed channel in which an SS capable of communicating only over one subchannel requests an allocation for 1500 bytes. This would mandate the BS to allocate a total of 8.25 ms (the order of an entire frame duration) solely for this subchannelized traffic. To allow this single allocation in combination with a few mandatory full OFDM symbol allocations, the BS would be forced to spread the allocation over multiple frames, causing excessive end to end delays. The third problem is that during initial ranging, substantial offsets from the desired received power can occur at the BS side, which could produce substantial distortion in other subchannels, were this to be allowed. With the adopted C80216a-02/90r7 language, subchannelization is only allowed after the SS power has been adjusted to result in near-equal received power at the BS side, so that this problem would not occur.

In addition, the adopted C80216a-02/90r7 language does not allow the use of UIUC 2, since an efficient method of requesting bandwidth has already been defined through UIUC 3 ("REQ Region Focused"), which also allows the SS to indicate its preference (though not a demand) for a subchannelized allocation. Of course, a SS can also use the REQ Region Full or the "piggy-backing" mechanism to request bandwidth. There is hence no need to duplicate the bandwidth request through a fourth mechanism.

The language under point 2) was omitted because it would not achieve any substantial additional preamble overhead reduction (which is the second aim of subchannelization, after granularity reduction), whereas the BS would have to deal with the increasingly difficult phase tracking problem due to the availability of only two pilots. The adopted C80216a-02/90r7 language allows for 5 bit, or 32 OFDM symbols of subchannelized allocation (allowing for 180 to 830 bytes of data). The overhead, 1 OFDM symbol preamble, would hence result in about 3% of overhead.

In addition, Comment 336 motivates the sought changes as a harmonization with the ETSI BRAN HIPERMAN OFDM PHY. It should be noted that this has been achieved fully by the language in C802.16a-02/90r7, as the omitted changes listed above are not part of that draft standard either (see BRAN30d023r1).

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 337 **Submitted by:** Vladimir Yanover Member 2002/10/09

Comment Type Technical, Binding **Starting Page #** 143 **Starting Line #** 56 **Fig/Table#** **Section** 8.4.3

The 256 OFDM system can be greatly improved by adding an optional sub-channelization support in the UL.
Sub-channelization has the following advantages:
a. It reduces data granularity.
b. It reduces overheads due to preambles.
c. It allows power concentration in increased link budget in the UL.

The reduction in data granularity and preamble overheads is mostly noted for short packets, which are a major part of the IP traffic. Power concentration can be allow to reduce the transmit power of the SS, thereby allowing the use of smaller and cheaper power amplifiers.

Sub-channelization was already adopted into the ETSI-BRAN HiperMAN standard for the 256FFT OFDM mode.

In order to achieve an efficient system, and to increase harmonization with the HiperMAN standard, sub-channelization should be adopted in 802.16a.

Suggested Remedy

Supporting subchannelization requires the following: changes
a. Divide the channel into subchannels.
b. Change the UL map to support Subchannelization. The approach here was proposed by Nico and is similar to that of HiperMAN. A new Subchannelization_IE is defined. This element defines a region in the UL for which subchannelization is employed. The element also defines how many subchannelization UL map elements are to follow.
c. Change the FEC mechanism to CC only for subchannelization. No change when subchannelization is not employed. The motivation is that CC code work better for small block sizes than CC+RS.

a. Divide the channel into subchannels

page 143:
"
When subchannelization is employed, the channel is dived into subchannels as shon in table 116ab:
table 116ab

Subchannel number: Allocated frequency offset indices of carriers
1: {-100,…,-89},{-50,...,-39},{1,...13},{51,...,63}
2: {-88,…,-76},{-38,...,-26},{14,...,25},{64,...,75}
3: {-75,…,-64},{-25,...,-14},{26,...,38},{76,...,88}
4: {-63,…,-51},{-13,...,-1},{39,...,50},{89,...,100}
"

b. Change the UL map

Add section 8.4.4.3.5 UL MAP Subchannelization information element

Within a frame, the BS may allocate a portion of the UL allocations to sub-channelized traffic. The UL_subchannelization_IE implicitly indicates the start of the allocation and explicitly indicates the Duration and the Number of allocations. A SS not capable of subchannelization shall skip the number of allocation times 7 nibbles that follow, and resume interpreting the UL-MAP afterwards with the start of the next allocation Duration OFDM symbols after the last allocation ended.

Table 116az-OFDM UL subchannelization IE Format

Subchannelization_IE() {
extended UIUC 4 bits subchannelization = 0x03
Duration 12 bits Cumulative duration of the allocations
Number of allocations 12 bits Number of sub-channelized allocations following this IE
}
….

A SS capable of sub-channelization shall decode the sub-channelized allocations, whereby the 12 bit Duration field in non-sub-channelized UL-MAP messages is replaced by a 3 bit Subchannel Index field and 5 bit Duration field as shown in Table 116at. A sub-channelized allocation shall start when all previous allocations to all allocated sub-channels have terminated.

In table 116at replace the 'Duration' row with:
"
else If (BS supports subchannelization and UIUC = 1,2 ,5:13) {
Subchannel Index 3 bits
0x0 Reserved

0x1 Sub-channel 1
0x2 Sub-channel 2
0x3 Sub-channel 3
0x4 Sub-channel 4
0x5 Sub-channel 1 and 3
0x6 Sub-channel 2 and 4
0x7 Reserved

Duration 5 bits
}
else
Duration 12 bits

}

"
Add
"
"If several consecutive allocations are granted to the same SS on same subchannels and UIUC values, then the SS shall use all allocations for sending a single PHY burst"

c. add CC only

Add to Table 116ab 1/2, 10, 1,1,X1Y1

When sub-channelization is active (see 8.4.4.3.5), the FEC shall bypass the RS encoder and use the Overall Coding Rate as indicated in Table 116ac as CC Code Rate. The Uncoded Block Size and Coded Block size may be computed by dividing the values listed in Table 116ac by 4 and 2 for 1 and 2 sub-channel allocations respectively.

Resolution of Group **Decision of Group: Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The comment is similar to that of Comment 336, and the proposed remedy is identical. Please see Comment 336 comments for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 344 **Submitted by:** Tal Kaitz Member 2002/10/10

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** **Fig/Table#** **Section** 8.4.5.3

Comment 212, resubmitted

This comment is supplementary to the subchannelization comment (#11 #162 #166 #167), and is resubmitted.

To gain the full benefits of subchannelization, the system needs to optionally support subchannelized transmissions in the REQ-region-full.

Suggested Remedy

Add in pg 168/line 62:
"REQ-region Full interval can be allocated to SSs which use subchannelization. In this case the BS allocates an UL interval using the procedure of 8.4.4.3.5 and an UIUC code of 2"

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The proposed remedy is identical in scope to permitting the usage of UIUC 2 ("REQ Region Full) when using subchannelization in Table 116at as proposed in Comments 330, 336 and 337. Please see the response to Comment 336 for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 346 **Submitted by:** Marianna Goldhammer Member 2002/10/10

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** 62 **Fig/Table#** **Section** 8.4.5.3

To gain the full benefits of subchannelization, the system needs to optionally support subchannelized transmissions with the REQ-region-full. The OFDM system can use the proposed transmission as an additional method to regular methods, without affecting inter-operability of OFDM only SS.
For a sub-channelization enabled system, there may be SS that will work in up-link only in sub-channelized mode, due to link budget limitations. The cell size will be increased, accordingly to the 5-6dB increase in the link budget.

This explanation of interoperability with the OFDM mode was missing from the initial comment. The group should re-evaluate the proposal, based on the new clarifications.

Suggested Remedy

Add in page 168/line 62:
"REQ-region Full interval can be allocated to SSs which use subchannelization. In this case the BS allocates an UL interval using the procedure of 8.4.4.3.5 and an UIUC code of 2"

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The proposed remedy is identical in scope to permitting the usage of UIUC 2 ("REQ Region Full) when using subchannelization in Table 116at as proposed in comments 330, 336 and 337. Please see the response to Comment 336 for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 350 **Submitted by:** Vladimir Yanover Member 2002/10/09

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** 62 **Fig/Table#** **Section** 8.4.5.3

To gain full benefits from the subchannelization, the system needs to support the REQ-region-full functionality in subchannelized region.

Suggested Remedy

Add at page 168, line 62:

"REQ-region Full interval can be allocated to SSs which are able to use subchannelization. In this case the BS allocates an UL interval using the procedure specified in 8.4.4.3.5 and an UIUC = 2"

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The proposed remedy is identical in scope to permitting the usage of UIUC 2 ("REQ Region Full) when using subchannelization in Table 116at as proposed in comments 330, 336 and 337. Please see the response to Comment 336 for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 345 **Submitted by:** Marianna Goldhammer Member 2002/10/10

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** 53 **Fig/Table#** **Section** 8.4.5.2

There are advantages for optionally using only a sub-channel, instead all all carriers, for initial ranging, with systems supporting optional sub-channelization. The OFDM system can use the proposed ranging as an additional method to regular ranging methods, without affecting inter-operability of OFDM only SS.
For a sub-channelization enabled system, there may be SS that will work in up-link only in sub-channelized mode, due to link budget limitations. The cell size will be increased, accordingly to the 5-6dB increase in the link budget.

This explanation of interoperability with the OFDM mode was missing from the initial comment. The group should re-evaluate the proposal, based on the new clarifications.

Suggested Remedy

Add in page 168/line 62:
"The initial ranging interval can be allocated to SSs which use subchannelization. In this case the BS allocates an UL interval using the procedure of 8.4.4.3.5 and an UIUC code of 1."

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The proposed remedy is identical in scope to permitting the usage of UIUC 1 ("Initial Ranging") when using subchannelization in Table 116 as proposed in Comments 330, 336 and 337. Please see the response to Comment 336 for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 348 **Submitted by:** Tal Kaitz Member 2002/10/10

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** 62 **Fig/Table#** **Section** 8.4.5.2

Comment 211, resubmitted

TThis comment is supplementary to the subchannelization comment (#11 #162 #166 #167), and is resubmitted.

To gain the full benefits of subchannelization, the system needs to optionally support subchannelized transmissions in the initial ranging interval.

Suggested Remedy

Add in pg 168/line 62:
"The initial ranging interval can be allocated to SSs which use subchannelization. In this case the BS allocates an UL interval using the procedure of 8.4.4.3.5 and an UIUC code of 1."

Resolution of Group **Decision of Group:** Accepted-Modified

Reason for Group's Decision/Resolution

The proposed remedy is identical in scope to permitting the usage of UIUC 1 ("Initial Ranging") when using subchannelization in Table 116 as proposed in Comments 330, 336 and 337. Please see the response to Comment 336 for discussion of this issue.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 351 **Submitted by:** Vladimir Yanover Member 2002/10/09

Comment Type Technical, Binding **Starting Page #** 168 **Starting Line #** 62 **Fig/Table#** **Section** 8.4.5.3

The system needs to support Focused Bandwidth requests in the subchannelization region.
After a BS successfully decoded a focused contention request, it needs to know whether to allocate a subchannelized or a non-subchannelized transmit opportunity.
The following solution was suggested by Marc Engels from IMEC for the HiperMAN. The set of contention codes is split in two. The first N codes are used by SSs that required subchannelized BW requests. The rest of the codes are used for non-subchannelized BW requests. The parameter N is configurable.

Suggested Remedy

Add at the page 169, line 22:
"If the BS supports subchannelization, the first N contention codes shall be used by those SSs that are able to use the subchannelization. The value of N is transmitted at the UCD channel (TLV encoded). The default is N = 0."

Add at the page 240, Table 122 one more entry"
"Name= Subchannelization focused contention code
Type=18
Length=1
Value= Number of contention codes used by those SSs that are able to use the subchannelization. Possible values 0-7, default = 0
PHY scope = OFDM"

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The language adopted in C802.16a-02/90r7 provides the mechanism of allocating certain Focused Contention codes for SSs to REQUEST a subchannelized allocation as per the suggested remedy. However, this language differs from the proposed remedy in that the proposed remedy seeks the mechanism of allocating certain Focused Contention codes for SSs to DEMAND a subchannelized allocation. The reason why this was not adopted is that it places undesirable additional constraints on the BS scheduler as discussed as "second problem" in Comment 336.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 342 **Submitted by:** David Trinkwon Member 2002/10/11

Comment Type Technical, Binding **Starting Page #** 161 **Starting Line #** 42 **Fig/Table#** 116 **Section** 8.4.3.9

Comments 196 and 197 were rejected at Mtg #21 (Cheju) becasue of failure to agree on a combination of proposals for revised Frame Duration Codes. Based on the discussions at the meeting a new "consensus" proposal is submitted for the OFDM table - see doc **C802.16-02/89**.

Suggested Remedy

Replace Page 161 Table 116am with the revised table in doc **C802.16-02/89**

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The changes adopted per C802.16a-02/90r7 implement the Frame duration codes and Frame duration actual values sought by the Commentor. They do not add a column with "nominal values", as this is superfluous to the actual values. The Commentor has not expressed full satisfaction with the resolution, but the Ballot Resolution Committee believes that the differences are editorial only.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 352 **Submitted by:** David Trinkwon Member 2002/10/11

Comment Type Technical, Binding **Starting Page #** 192 **Starting Line #** 36 **Fig/Table#** 116 **Section** 8.5.4.4

Comments 196 and 197 were rejected at Mtg #21 (Cheju) becasue of failure to agree on a combination of proposals for revised Frame Duration Codes. Based on the discussions at the meeting a new "consensus" proposal is submitted for the OFDMA table - see doc **C802.16-02/89.**

Suggested Remedy

Replace Page 192 Table 116bi with the revised table in doc **C802.16-02/89**

Resolution of Group **Decision of Group:** **Accepted-Modified**

Adopt changes in C802.16a-02/90r7.

Reason for Group's Decision/Resolution

The changes adopted per C802.16a-02/90r7 with regards to this comment implement the Frame duration codes, Frame duration nominal values, and Frame duration actual values sought by the Commentor, with the exception of the nominal value 3.33 ms, which was replaced with a 3.5 ms nominal value. The Commentor has not expressed full satisfaction with the resolution, but the Ballot Resolution Committee believes that the differences are editorial only.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 326 **Submitted by:** John Barr Member 2002/10/11

Comment Type Technical, Binding **Starting Page #** **Starting Line #** **Fig/Table#** **Section**

The process used by the 802.16 committee during recirculation does not allow balloters to reasonably access totality of changes resulting from resolution of comments. Also, the originally provided documentation for the recirculation ballot was incomplete and not corrected until one day before the recirculation ballot closed.

Suggested Remedy

Declare the recirculation ballot invalid until a time when the following are completed:

1. All Technical Binding commenters are asked to state whether their comments were satisfactorly resolved and documentation of unsatisfactory resolutions are included with the recirculation ballot.

2. An updated draft is prepared with appropriate change indications to allow balloters to determine where changes were made and how they may affect their next ballot.

Resolution of Group **Decision of Group:** **Accepted-Modified**

Conduct a second recirculation, to include an updated draft incorporating changes as documented by resolutions adopted by Ballot Resolution Committee. This second recirculation will include all comments requiring recirculation in which relevant fields were truncated during first recirculation.

Reason for Group's Decision/Resolution

The Ballot Resolution Committee recognizes the importance of recirculating an updated draft

The Ballot Resolution Committee recognizes that some balloters had incomplete access to comments and resolutions due to field truncation in the PDF distributed with the first recirculation.

The recirculation process provides the requested opportunity for commenters “to state whether their comments were satisfactorly resolved.” Also as requested, the resulting “documentation of unsatisfactory resolutions” (as collected during recirculation) is included with the recirculation package. The process followed is as described in the IEEE-SA Standards Board Operations Manual: 'If the negative vote is not satisfied, either entirely or in part, the negative voter shall be informed of the reasons for the rejection and be given an opportunity either to change his or her vote to "approve" or to retain his or her negative vote *during a recirculation ballot*.'

The request for an updated draft with change indications is labor-intensive and difficult to accommodate. However, in order to accommodate the balloter's request ("to allow balloters to determine where changes were made"), recirculation will follow the appropriate rule in the IEEE-SA Standards Board Operations Manual: "all substantive changes" will be recirculated.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 325 **Submitted by:** John Barr Member 2002/10/11

Comment Type Technical, Binding **Starting Page #** **Starting Line #** **Fig/Table#** **Section**

Resolution of comments 123 and 124 are not satisfactory and my disapprove vote still holds.

Suggested Remedy

Correct draft to include methods for realistic coexistence with other IEEE 802 radios that are designed to share the license-exempt bands or remove operation of 802.16a in any of the license-exempt bands to prevent interference with privately owned WLANs or other radios using the license-exempt bands that conform to realistic coexistence rules.

Resolution of Group **Decision of Group:** Rejected

Reason for Group's Decision/Resolution

802.16's approach is in line with the approach taken by the other wireless groups within 802.
Within this context, “primary user” refers to a regulatory designation, regardless of technology.
Requiring the detection of any 802 compliant wireless system, current and future, would be prohibitive.

The specified DFS mechanism is frequency independent.

This issue would be different if all license-exempt systems required DFS (as in the CEPT RLAN bands). However, given that other 802 standards do not mandate DFS, placing the entire burden on MAN systems is unreasonable.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 123 **Submitted by:** John Barr Member

Comment Type Technical, Binding **Starting Page #** 90 **Starting Line #** **Fig/Table#** **Section** 6.2.14

The use of only "primary users" to determine when a channel should not be used does not prevent a P802.16a BS or SS from interferring with a currently operating IEEE 802 wireless system using that same channel. P802.16a should follow recommendations for allowing multiple IEEE 802 wireless systems to operate on separate channels in license-exempt bands.

The informative text in appendix B provides a good analysis of possible interference with existing IEEE 802 wireless systems, but mistakenly makes the assumption that P802.16a deployments will not interfere with other IEEE 802 wireless systems in the license-exempt bands since the only outdoor usage would be for public hot spots. However, there is a growing acceptance of 802.11b/a/g wireless systems for home usage, some of which will be extended to 'backyard' areas around a home for the convenience of the homeowner. The lack of a mechanism within P802.16a to mitigate interference with home IEEE 802 wireless systems must be corrected before this becomes an official IEEE standard.

Suggested Remedy

Modify text in 6.2.14 to include IEEE 802 wireless systems as users of channels to be avoided as stated for primary users. Also update to ensure that avoidance of operating IEEE 802 wireless systems includes those operating in the 2.4 GHz license-exempt band.

Resolution of Group **Decision of Group:** Rejected

vote: in favor 0
against 20

Reason for Group's Decision/Resolution

{Note: this comment was included in the first recirculatation, but in truncated form. Therefore, it is being included in the second recirculation verbatim.}

802.16's approach is in line with the approach taken by the other wireless groups with 802.
Within this context, primary user refers to a regulatory designation, regardless of technology.
Requiring the detection of any 802 compliant wireless system, current and future, would be prohibitive.
The specified DFS mechanism is frequency independent.
This issue would be different if all license-exempt systems required DFS (as in the CEPT RLAN bands), but given that other 802 standards do not mandate DFS, placing the entire burden on MAN systems is unreasonable.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 124 **Submitted by:** John Barr Member

Comment Type Technical, Binding **Starting Page #** 90 **Starting Line #** 10 **Fig/Table#** **Section** 6.2.14.2

The definition of "primary user" used in this document does not promote the coexistence of P802.16a with other IEEE 802 standards that may also be operating in the license-exempt bands. The statement "A BS or SS shall not use a channel that it knows contains primary users or has not been tested recently for the presence of primary users." does not prevent a BS or SS from establishing operation on a channel already being used by another IEEE 802 wireless system (e.g., 802.11b/a/g or 802.15.1/3/4).

Suggested Remedy

Change "A BS or SS shall not use a channel that it knows contains primary users or has not been tested recently for the presence of primary users." to "A BS or SS shall not use a channel that it knows contains primary users or other IEEE 802 wireless systems, or has not been tested recently for the presence of primary users or other IEEE 802 wireless systems."

Resolution of Group **Decision of Group:** Rejected

Reason for Group's Decision/Resolution

see comment 123

This comment was a subject of the first recirculation. It is out of scope of the second recirculation but is included in the ballot package for completeness

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 004 **Submitted by:** Mike Geipel Member

Comment Type Technical, Binding **Starting Page #** **Starting Line #** **Fig/Table#** **Section**

The 802.16 standard needs to reflect the current realities of dimished R&D spending. While the technological concepts included in the latest version of the standard is impressive, the odds are slim that a critical mass of companies will commit the level of R&D investment required to realize the current spec into a commercial system. To establish itself as a true industry standard the 802.16 specification must be more than an optimal engineering solution to wireless propagation, it must also achieve a balance with respect to the level of effort required to realize the associate hardware and software.

The history of technology adoption teaches us that technology changes typically occur in incremental steps and that the most deterministic (i.e. low risk) steps are the simple ones. With this simplicity heuristic as our guide, a number of changes are suggested to the current 802.16a/D5-2002 standard in order to match the current realities of R&D investments.

Suggested Remedy

- Make ITU J.83 Annex A or B an optional transmit encoding scheme
- Make adaptive modulation optional.
- The MAC is functionally equivalent to the DOCSIS MAC, why not adopt the DOCSIS MAC and list possible enhancements as options.

Resolution of Group **Decision of Group:** Rejected

vote:
0 in favor
21 against

Reason for Group's Decision/Resolution

{Note: this comment was included in the first recirculatation, but in truncated form. Therefore, it is being included in the second recirculation verbatim.}

The Working Group recognizes the economic realities that influence the acceptance of a standard. It believes that it has found the right balance, introducing advanced technology that can be economically developed and deployed. The group does not believe it would benefit the standard to introduce addtional transmit encoding options. It believes that adaptive modulation is essential to the successful operation of a system in the long term.

In order for a standard to be success, it also has to be capable of effective operation in the intended environment. The ITU J.83 PHY (which, by the way, is used in DOCSIS) was designed for FDD *cable* systems, and solves a different set of problems from BWA. Some of the shortcomings of the ITU J.83 PHY and DOCSIS MAC proposal for the 802.16a application are as follows: it

a) is not defined for TDD systems (a functional requirement of 802.16a);

b) does not perform well (has low capacity) in the NLOS slow fading environments typical of 802.16a applications (see BWIF white paper for documented details, since it does use the DOCSIS PHY in comparisons with V-OFDM);

c) does not possess framing/modulation structures that facilitate capacity-improving channel estimation and equalization techniques;

d) does not possess pilot symbols and preambles that enable fast acquisition and re-acquisition when a fade is experienced (note that preambles also facilitate TDD operation);

e) does not enable the operator to implement MAC-based ARQ, and therefore must rely on ARQ from TCP/IP, which greatly reduces capacity over a slow fading channel;

f) does not enable the use of per-user adaptive modulation which greatly improves capacity, since, unlike cable, not all users have the same CINR (both distances and shadowing).

g) Has no mechanism to introduce other BWA capacity enhancing options, including space-time coding, AAS, and MESH.

Document under Review: 802.16a/D5 **Ballot Number:** 802.16a **Comment Date**

Comment # 006 **Submitted by:** Paul Nikolich Member

Comment Type Technical, Binding **Starting Page #** **Starting Line #** **Fig/Table#** **Section**

The MAC protocol relies on a higher layer (TCP/IP) functions like DHCP, UDP, and Time-of-Day services to provide configuration information to the MAC and is specified to be the 'communication channel' between the Base Station and the Subscriber stations (for example in 6.2.15 MAC Management Message tunneling in Mesh Mode).

This causes architectural problems - ideally protocol layer (n) should be independent of protocol layer (n+1). In the case of 802.16a, if the higher layer functionality is not working, then the layer 2 network does not operate correctly.

Suggested Remedy

Restrict node state, MAC messaging and inter-node communications within layer 2 and to not be reliant on any higher layer functionality.

Resolution of Group **Decision of Group:** **Accepted-Modified**

Insert on page 6, line 44: Though the MAC specification invokes IP protocols, they are required only as a standard basis for element management rather than MAC operation, since, in all practicality, element management is necessary in this type of network.

Reason for Group's Decision/Resolution

For PMP systems:
The MAC does not really rely on the higher layer protocols. These functions are intended to be a standard way of providing connectivity between the SS and a network management and/or element management system. From the MAC's point of view, the SS could simply respond to the BS with a TFTP-CPLT message and be done with it. The SS would be unmanageable at the NOC level, but you could still authenticate, set up services, transfer data, perform RLC functions, etc. So from a MAC point of view none of the higher layer functions are required. However, they are required as a standard basis for element management (rather than MAC) since, in all practicality, element management is necessary in this type of network.

For mesh systems:
In mesh systems there is need to support transactions that take place between entities separated by multiple hops. This need arises out of the following:
The intermediate nodes neither have access to nor should be trusted with all information necessary to complete all transactions that currently rely on MAC message tunneling.

Also in 802 the CIDs (the addresses used by the MAC layer) are unique only over a single hop and not known by the BS if separated from a node by more than a single hop. Also 802.16 does not include routing functionality that is necessary for making correct forwarding decisions as this functionality is non-trivial and is already readily available for IP.

The current choice of tunneling the MAC messages over UDP is motivated by the following facts:
1) Tunneling the messages over UDP provides, in conjunction with off the shelf higher layer protocols, a mechanism to deliver the MAC message over multiple hops to the intended recipient.
2) The implementation burden of the current approach is minimal on the devices supporting mesh.
3) The tunneling does not compromise the security of the authentication and authorization transactions.

This comment was a subject of the first recirculation. It is out of scope of the second recirculation but is included in the ballot package for completeness.

PAR FORM

02/13/02

PAR Status: Revision of Amendment

PAR Approval Date: 02/14/2002

PAR Signature Page on File: Yes

Review of Standards Development Process: No

1. Assigned Project Number: 802.16a

2. Sponsor Date of Request: 11/16/2001

3. Type of Document: Standard for

4. Title of Document:

Draft: Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz

5. Life Cycle: Full Use

6. Type of Project:

6a. Is this an update to an existing PAR? Yes

If YES: Indicated PAR number/approval date: 802.16a - 3/30/2000

If YES: Is this project in ballot now? No

6b. The project is a: Amendment to Std. 802.16-2001

7. Contact Information of Working Group:

Name of Working Group (WG): 802.16 Working Group on Broadband Wireless Access

Name of Working Group Chair: Roger B Marks

Telephone: (303) 497-3037 **FAX:** (303) 497-7828

Email: r.b.marks@ieee.org

8. Contact Information of Official Reporter (If different than Working Group Chair)

Name of Official Reporter: (if different than WG Contact)

Telephone: **FAX:**

Email:

9. Contact Information of Sponsoring Society or Standards Coordinating Committee

Name of Sponsoring Society and Committee: Computer Society/Local and Metropolitan Area Networks
Microwave Theory and Techniques Society

Name of Sponsoring Committee Chair: Paul Nikolich

Telephone: 857-205-0050 **FAX:** 781-334-2255

Email: p.nikolich@ieee.org

Name of Liaison Rep.(If different than Sponsor Chair):

Telephone: **FAX:**

Email:

10. The type of ballot is: Individual Sponsor Ballot

Expected Date of Submission for Initial Sponsor Ballot: 04/30/2002

11. Fill in Projected Completion Date for Submittal to RevCom: 8/2/2002

Explanation for Revised PAR that completion date is being extended past the original four-year life of the PAR:

12. Scope of Proposed Project:

This standard specifies the physical layer and medium access control layer of the air interface of interoperable fixed point-to-multipoint (and, in license-exempt bands, optional mesh topology) broadband wireless access systems (e.g., those supporting data rates of DS1/E1 or greater). The specification enables access to data, video, and voice services with a specified quality of service in licensed bands designated for public network access and license-exempt bands. It applies to systems operating between 2 and 11 GHz, where such services are permitted. This Amendment expands the scope of the IEEE Standard 802.16 by extending it to bands between 2-11 GHz, whereas the scope of the original project was limited to 10-66 GHz.

13. Purpose of Proposed Project:

To enable rapid worldwide deployment of innovative, cost-effective and interoperable multi-vendor broadband wireless access products. To facilitate competition in broadband access by providing wireless alternatives to wireline broadband access. To facilitate coexistence studies, provide mechanisms for coexistence with other license-exempt band systems such as 802.11 and 802.15, encourage consistent worldwide allocation, and accelerate the commercialization of broadband wireless access spectrum. Utilization of frequencies from 2 to 11 GHz will address a market that includes residences, Small Office-Home Office (SOHO), telecommuters and Small and Medium Enterprises (SME).

14. Intellectual Property

Sponsor has reviewed the IEEE patent policy with the working group? Yes

Sponsor is aware of copyrights relevant to this project? Yes

Sponsor is aware of trademarks relevant to this project? Yes

Sponsor is aware of possible registration of objects or numbers due to this project? Yes

15. Are you aware of other standards or projects with a similar scope? Yes

· The ETSI BRAN HIPERMAN Project is currently focusing on licensed frequencies between 2 and 11 GHz and license-exempt frequencies in the 5.725-5.875 GHz band. · T1P1.4 is currently developing air interface standards for Fixed Wireless Access to the PSTN Network. The primary focus of the group is wireless access to POTS, ISDN and Fractional T1/E1 services delivered via the public circuit switched telephone network, although their charter does include packet data services. The individual user data rates currently contemplated by this group range from 8 Kb/s to 2 Mb/s. · IEEE 802.11, ETSI HIPERLAN/2 and 802.15 address primarily short range WLAN and WPAN applications, respectively. The amendment is specifically directed towards longer-range wireless point to multipoint MAN systems that provide access to core public networks. These systems typically serve large numbers of dispersed subscribers. · ITU-R Working Party 8F is developing air interfaces for IMT-2000 and access systems beyond IMT-2000 for both mobile and fixed applications. · Broadband Wireless Internet Forum (IEEE ISTO/BWIF) is developing industry specifications for similar frequency bands and applications. · DVB-RCT (EN 301 958) is an ETSI standard for video distribution and broadband wireless access.

Similar Scope Project Information:

16. Is there potential for this standard (in part or in whole) to be submitted to an international organization for review/ adoption?

Yes

If yes, please answer the following question:

Which International Organization/Committee? ITU

International Contact Information:

Jose M Costa
Phone: 613-763-7574
FAX: 613-765-1225
Email: j.costa@ieee.org

17. Will this project focus on Health, Safety or Environmental Issues? No

18. Additional Explanatory Notes:(Item Number and Explanation)

5a) This PAR updates P802.16a to encompass P802.16b and should be accompanied by the withdrawal of the latter. In the process of developing P802.16a and P802.16b drafts, the documents have been integrated technically and editorially and are anticipated to draw largely overlapping ballot pools. Proceeding with separate projects is no longer beneficial.

Jodi Haasz

02/14/2002 07:22 AM

To: P.Nikolich@ieee.org
cc: r.b.marks@ieee.org, tony@jeffree.co.uk
Subject: P802a and P802.16a

14 February 2002

Mr. Paul Nikolich
Broadband Access Systems
18 Bishops Lane
Lynnfield, MA 01940

Re: P802a Local and Metropolitan Area Networks - Overview and Architecture - Amendment 1: Ethertypes for prototype and vendor-specific protocol development

P802.16a Amendment to IEEE Standard for Local and Metropolitan Area Networks - Part 16: Air Interface for Fixed Broadband Wireless Access Systems - Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz

Dear Paul:

I am pleased to inform you that on 14 February 2002 the IEEE-SA Standards Board approved the above referenced projects until December 2006 and December 2004, respectively. A copy of the file is attached in .pdf format.

Now that your projects have been approved, please forward a roster of participants involved in the development of these projects. This request is in accordance with the IEEE-SA Operations Manual, Clause 5.1.2f under *Duties of the Sponsor* which states:

"Submit annually to the IEEE Standards Department an electronic roster of individuals participating on standards projects"

Attached is an Excel spreadsheet for your convenience. Please forward these lists to me via e-mail at j.haasz@ieee.org no later than 1 May 2002.

At the bottom of this e-mail, please find URLs which you may find useful in the development of your proposed standard and in submitting your final draft for approval. We strongly recommend that a copy of your draft be sent to this office for review prior to the final voting by the working group to allow for a quick review by the editorial staff before sponsor balloting.

If you should have any further questions or would like to receive this information in paper, please contact me at 732-562-6367 or by email at j.haasz@ieee.org.

Sincerely,

Jodi Haasz
Senior Administrator
IEEE-SA Governance and Electronic Processes

PS - The information in the .pdf file is viewable in Adobe Reader, version 3.0 or higher. If you do not have this software, please go to http//www.adobe.com/prodindex/acrobat/readstep.html#reader to download the free version.

Comment # 001 **Comment submitted by:** Jennifer Longman

Type Editorial

Comment

I have reviewed IEEE P802.16a/D5 and find that it meets all conditions of editorial review.

Suggested Remedy

Comment # 002 **Comment submitted by:** Jennifer Longman

Type Editorial

Comment

IEEE P802.16a/D5 meets all phases of SCC 10 coordination.

Suggested Remedy

Here is a courtesy copy of a ballot for P802.16a/D5
just submitted:

```
# Ballot/Comment Data for 0000224 (P802.16a/D5)
# Submitted Mon Aug 19 16:08:28 EDT 2002
# Type: ballot
# Record Number: 00601054

ballot_code = 0000224
form_type = ballot
ieee_number = 00601054
name = Bruce Barrow
email = bbarrow@nist.gov
phone = 301-493-4374
fax = 301-493-6363
org = IEEE SCC14
vote = Coordination
```