Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**WirelessHUMAN™ Minutes from 802.16 Session #9**
Date Submitted	**2000-10-24**
Source(s)	Drayt Avera Acting Secretary Voice: 404-876-7707 x24 Fax: 404-876-7484 E-mail: davera@rf-solutions.com
Re:	**WirelessHUMAN™ Study Group Meetings at 802.16 Session #9 (Denver, Colorado, USA, 12-15 September, 2000)**
Abstract	This document records the minutes of 802.16's WirelessHUMAN™ Study Group in meetings held at 802.16 Session #9
Purpose	To record progress and decisions of the Study Group.
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WirelessHUMAN™ Minutes from 802.16 Session #9
Denver Marriott Southeast, Denver, Colorado, USA
12-15 September, 2000

9/12/00

8:30am: Durga Satapathy called meeting order with Drayt Avera filling in as secretary for Sanjay Moghe. An agenda to review contributions and develop a draft PAR and 5 criteria for the WirelessHUMAN study group was reviewed and approved unanimously.

Reviewed results from July meeting relevant to PAR and 5 criteria. Discussed PAR and 5 criteria details with general comments on wording and focus from Jim Carlo and Mika Kasslin. Goal is to have PAR approved this session for review by 802.11 during the week of 9/20/00. This permits revision as necessary prior to the 10/6/00 PAR final submittal date.

A request was made for a volunteer to be the liaison for the 802.11 meeting in place of the Chairman (D. Satapathy) and the Secretary (S. Moghe) who will not be available. No volunteers were received, so review of any approved PAR will have to be handled via email and telephone calls.

A series of contributions were reviewed as follows:

802.16hc-00/06: Comparison of QPSK/QAM, OFDM, and Spread Spectrum for 5-6 GHz PMP BWAs prepared by Malcolm Sellers and Demos Kostas of Adaptive Broadband:
This presentation compared OFDM, FHSS, DSSS and single carrier systems, with a resulting recommendation of using a single carrier based PHY and narrow beam antennas to create a MAN system.

Responding comments included:
D. Avera: Pointed out that the 5.725-5.825 GHz bands are shared with ISM bands, so in addition to other UNII band devices, the system must be able to tolerate interference created by devices approved under ISM rules which may be FHSS or DSSS.

Z. Hadad: Challenged assumptions that the guardband and backoff requirements of single carrier systems are better than OFDM systems. Also pointed out that coded OFDM should be presented and that OFDM will offer better interference protection for these unlicensed bands.

J. Tavormina: Brought out a point that OFDM may help make these systems more effective in non-LOS conditions.

M. Sellars: Recommended that we also hear a presentation being given by D. Falconer at the TG3 meetings. D. Satapathy agreed to arrange for the presentation to be made to this group later in the week.

802.16hc-00/07: Specifying TDD for the Proposed WirelessHUMAN Standard by Demos Kostas of Adaptive Broadband:

This presentation compared the tradeoffs in TDD vs. FDD architecture to create a MAN system with a resulting recommendation to use a TDD approach.

Responding comments included:
B. Buskila: Raised a desire to have both TDD and FDD systems supported.

Z. Haddad: Pointed out that cell to cell interference and CPE synchronization issues are important and would need to be addressed.

802.16hc-00/08: An OFDM Approach by Yossi Segal and Dr. Zion Haddad

This presentation showed an OFDM solution using modified version of 802.11a OFDM to create higher carrier counts than currently used on 802.11a.

Responding comments included:
M. Kasslin: Synchronization may be an issue on the uplink side. Maybe carriers could be used for sync.

Others: A greater number of subcarriers requires supporting higher peak to average power ratios (PAPR). Longer codes will also have increased synchronization and decoding times.

802.16hc-00/09: Applicability of 802.11 and HIPERLAN/2 for WirelessHUMAN Systems by Mika Kasslin and Nico van Waes

This presentation compared the tradeoffs in the two standards in regard to WirelessHUMAN needs. Proposed that a TDMA style system with centralized control is more appropriate for a MAN system. Also recommended non-LOS support and coexistence with existing HIPERLAN/2, 802.11a standards.

Responding comments included general discussion of topics including: LOS vs. non-LOS, asymmetric link support, and the use of directional antennas as a cost effective co-channel solution.

802.16hc-00/11: Information on FCC Rules in License-free Bands by Skip Crilly

This presentation reviewed the existing FCC rules in the license exempt U-NII and 2.4 GHz bands. In particular, a recent response from the FCC indicated that for a fixed wireless system, a narrow beam steerable antenna system might be permitted to operate under the same rules as a point to point system.

The session was adjourned for lunch.

After calling the afternoon session to order, the minutes of Session #8 were approved by unanimous voice vote. Contribution HC-10 was presented by Durga Satapathy in light of the absence of the contributor Chetan Khanna.

802.16hc-00/10: Comparison of Existing and Proposed Wireless Standards by Chetan Khanna

This presentation compared existing and proposed PHY and MAC features for IEEE802.11a, HIPERLAN/2, and IEEE802.16.1.

Responding comments included discussion of IEEE802.11e plans and the possibility of making a call for contributions to explore frequency sharing options.

The floor was opened to discussion on the requirements for WirelessHUMAN systems. The group agreed to a primary focus of the two upper U-NII bands due to current regulatory constraints, however the proposed standard could be applied to any frequency in the 2-11 GHz band. The attributes of the various MAC and PHY standards were discussed and compared to the needs of the WirelessHUMAN standards.

The study group prioritized the baseline standards for both MAC and PHY applicability to Metropolitan Area Network needs. The following lists and the order of precedence were approved by majority vote.

MAC:	PHY:
1) 802.16.1, 802.16.3	1) 802.11a, HIPERLAN/2
2) HYPERLAN/2	2) 802.16.3
3) 802.11e	3) 802.16.1

The session was adjourned for the day.

9/13/00

8:30am: Durga Satapathy called meeting order and reviewed the agenda. No additions were made and a contribution initially made for TG3 was presented.

802.16.3c-00/13: Modulation and Equalization Criteria for 2-11 GHz Fixed Broadband Wireless Systems by David Falconer and Sirikiat Lek Ariyavisitakul

This presentation discussed modulation and equalization options for single carrier vs. multiple carrier systems and performance and complexity tradeoffs.

Responding comments included general discussion that any of the approaches can be made to work, but that excessive tap length could impact responsiveness to fading conditions. Limiting this approach to fixed wireless access systems minimizes these effects because the constraints are less severe than mobile applications. The issue of needing to handle interference when operating in the unlicensed band was also discussed.

The WirelessHUMAN group then worked together to create a draft PAR and write the 5 criteria for PAR acceptance. The draft PAR was completed and prepared for presentation to the TG3 group the following morning.

9/14/00
8:00AM
The draft PAR and 5 criteria were presented to the IEEE 802.16.3 Task Group. General comments included:
PAR feedback:

1) The desire to permit mesh networks to be integrated in may cause delays and should be avoided.
2) How can we guarantee QOS when the media cannot be guaranteed? Should consider using various grades of service instead of a defined QOS.
3) Roger encouraged the study group to further narrow the scope of the project.
4) Comment that the 802.16.3 MAC should be the MAC of choice. This was no longer necessary when it was understood that 802.16.3 would be a modification of 802.16.1 MAC.
5) Consider adding 802.16.3 PHY to the scope. This was rejected due to the difference in the licensed and unlicensed operating environments and because the 802.16.3 PHY has not yet been defined.

5 Criteria feedback:

1) For more clarity, add more detail to the methods of interference techniques planned. Accepted.
2) Raised issue of how to make a cellular system installation using the limited number of channels provided by the 802.11a PHY. This subject will be addressed after becoming a working group.
3) Should include a multistandard base station? Address after becoming a working group.
4) Use the term License-exempt instead of unlicensed? Discussed and not implemented.
5) Why is the scope limited to 2-11 GHz? For economic and propagation reasons.
6) Suggested adding a specific timeline to help keep focus and scope limited. Accepted.

TG3 and WirelessHUMAN study group split into separate sessions.

The study group reviewed inputs from TG3 and adjusted the PAR and 5 criteria slightly to incorporate inputs. Prolonged discussions on narrowing the PAR scope occurred, especially regarding using an 802.11a type PHY. Created a timeline to add to the PAR.

Reviewed contribution as follows:

802.16hc-00/12: A High Speed Urban Wireless Data Communication System Implemented at 5.2/5.8Ghz by John Sydor

This contribution described a high speed urban wireless data communication system implemented using single carrier modulation at 5.2/5.8 GHz. The system design uses highly sectorized rosette structures for the cell hubs and high directivity, low sidelobe antennas to control co-channel interference at the CPE. It also provided propagation information for signals in the urban canopy environment.

9/15/00

8:15am session

Based on feedback from Roger Marks, the PAR was reviewed again for additional ways to narrow the scope of the group. In the interest of creating a standard within a short timeframe, the scope was defined to be modifications of 802.16.1 MAC and 802.11a / HYPERLAN/2 PHY. These changes were approved by a majority of the study group present.

The session was adjourned for the closing plenary. In the plenary, the PAR and 5 criteria were approved by the 802.16 Working Group with minor changes.

Appendix A

List of Attendees for 802.16 WirelessHUMAN Study Group at Session #9

Jacob Jorgensen	Malibu Networks
Chao-Chun Wang	Malibu Networks
T. J. Shan	Lucent
Mika Kasslin	Nokia
William Crilly	Agilent Technologies
Joseph Tavormina	Western Multiplex
Michael Stewart	Escape Communications
Matt Alspaugh	Wireless, Inc.
Yossi Segal	RunCom Technologies
Itzik Kitroser	RunCom Technologies
Zion Hadad	RunCom Technologies
Drayt Avera	RF Solutions
Malcolm Sellars	Adaptive Broadband
Hesham El-Damhougy	Western Multiplex
Baruch Buskila	WaveIP
Eli Avivi	WaveIP
Amarpal Khanna	Agilent Technologies
Behshad Baseghi	Malibu Networks
John Sydor	Communications Research Centre
Inchul Kang	Malibu Networks
Shugaka Shimada	Yokogawa Electric Co.
Arthur Wang	WirelessHome
Durga Satapathy	Sprint
Haim Harel	Magnolia Broadband
David Falconer	Carleton University
Raymond Thomas	Lucent