

WirelessHUMAN™ Study Group Activities at 802.16 Session #7

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Venue:

IEEE 802.16 Session #7 (1-5 May 2000 in Gaithersburg, MD, USA): First WirelessHUMAN™ meeting

Purpose:

To report WirelessHUMAN™ Study Group Activities at 802.16 Session #7.

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WirelessHUMAN™ SG

WirelessHUMAN™ Goals

- Identify license exempt bands suitable for fixed broadband MAN access – e.g. 5-6 GHz bands
- Investigate feasibility of developing an Air Interface Standard for the identified bands
- Investigate feasibility of using common MAC/PHY with IEEE 802.11 / IEEE 802.16.3
- Investigate relationship with 802.11, 802.15 and other standards groups

Key Issues

- What are the existing regulations in the various unlicensed bands, and what unlicensed bands may be appropriate for WirelessHUMAN systems?
- What mechanisms for interference avoidance/suppression, resource sharing, and ensuring adequate performance exist in unlicensed bands?
- What are the unique system design issues/requirements of WirelessHUMAN systems from a MAC/PHY layer perspective?
- Should the Study Group write a PAR to proceed with a standard? If so, should we try for July or wait until November?

WIRELESSHUMAN AGENDA

Date	Time	
2-May	8:00	Joint meeting 802.16.3 & WHUMAN SG Introductions and member sign up Review of Goals and Objectives Discussion and Acceptance of Agendas
	10:00	Discussion of Key Issues (Chair)
	10:15	Study Group Operating Procedures (Secretary)
	11:00	The Path Towards Efficient Coexistence in Unlicensed Spectrum - 802.16hc-00/03 Contribution from Jon Peha
	12:30	Lunch Break
	1:30	Joint Session with 802.16.3
	3-May	8:00
12:30		Lunch
1:30		Requirements for WirelessHUMAN Systems - 802.16hc-00/01 Contribution from Mika Kasslin at
2:30		Requirements for Broadband Wireless Access systems in the UNII bands - 802.16hc-00/02 Contribution from Vijaya Gallager
3:30		Break
3:45		Discuss CEPT Proposal
4:15		Discuss Report to 802.11/802.15
5:30		Dinner Break
4-May	8:00	802.16hc-00/04 Overview of UNII Regulations Contribution from Jamie Cornelius
	9:00	Discussion of WirelessHUMAN Milestones & PAR
	12:00	Lunch Break

The Path Towards Efficient Coexistence in Unlicensed Spectrum

Contribution No: 802.16hc-00/03

Prof. Jon M. Peha

Carnegie Mellon University

Key Points

- Greedy Devices: little incentive to share spectrum
- Greed escalates => terrible performance
- Solutions: Low Utilization / Etiquette Modifications

Requirements for WirelessHUMAN™ Systems

Contribution No: 802.16hc-00/03

Mika Kasslin & Nico Van Waes

Key Points

- Need for coexistence
- UNII characteristics => limited range/large antennae; severe multipath
- Coexistence with 802.11: Dynamic frequency selection + power control + adaptive modulation
- 802.16.1 => different market & frequency => Not appropriate
- 802.16.3 => licensed, higher tolerated EIRP
- 802.15 => Small range; not applicable
- 802.11a => coexistence discussions mutually beneficial
 - PHY suitable for multipath; applicable (comment: coexistence with OFDM with high no. of carriers may be an issue - needs study)
 - MAC designed for ISM; not applicable
- System Reqs: coexistence with 802.11; low cost; high coverage; QoS support (in-system & external interference); standardized authentication; easy installation
- Flexible network; various topologies => complexity is an issue
 - PMP system only or mesh architecture
 - Delay architecture choice discussion for later
- July PAR

Requirements for Broadband Wireless Access systems in the UNII bands

Contribution No: 802.16hc-00/02

Vijaya Gallager

Key Points

- 802.11 MAC - not applicable => flexible architecture/mobile/roaming/range mismatch
- 802.16.1 MAC - not applicable => frequency/applications
- 802.16.1 PHY - not applicable => interference issues
- 802.11a PHY- not applicable => multipath; mobile;OFDM cost
- 802.16.3 PHY: not applicable => interference issues
- 802.15 PHY: not applicable => range mismatch
- System Req: No mandate on protocols; low cost; simplicity
- PAR => try for July

FCC Regulations - ISM

Jamie Cornelius

Key Points

- Spread Spectrum requirement in ISM bands
- 1 Watt max power
- Minimum of 75 hopping channels

CEPT Proposal

- Impact on 5250-5350 MHz UNII band
- Exclusive to radio lans

PAR discussion

- July
 - Broad statement
 - Avoid delay
 - Timing important to be effective
 - not enough study
 - Strong need for differentiation from existing standards
 - discuss par timeline after joint meeting (11 & 15)
 - discuss with Roger

Next Steps

- Email Reflector
- Conference Calls
 - 802.11/802.15/HIPERACCESS tutorials
 - PAR discussion
- Interim Meeting
- Call for contribution on SG report/assessment

WirelessHUMAN™ System

Characteristics

- Metropolitan Area Network
- Services: voice, video & data
- Fixed/Nomadic Wireless Service Provider Application
- Operate in Unlicensed Frequency Bands (initial focus on outdoor UNII bands)
- Operation in presence of other unlicensed devices
- MAC/PHY efficiency to support MAN environment
- Cost and performance for residential/SOHO/SME/ customers
- QoS support (in-system & external interference)
- standardized registration/authentication
- ease of use & installation

Preliminary Assessment

- 802.16.3 PHY
 - TBD
 - Commonality in propagation characteristics
- 802.16.3 MAC
 - TBD
 - Potential synergies

Preliminary Assessment

- 802.11a PHY
 - Optimized for LAN peer-to-peer traffic and bandwidth requirements
 - Optimized for indoor multipath; needs evaluation for outdoors
 - No provision for dynamic frequency selection and power control
- 802.11 MAC
- MAC designed for ISM bands (Needs Evaluation)
 - assumption of negligible propagation delay
 - enforces Listen Before Talk (LBT) rule
 - Designed for bursty traffic, not for voice/CBR applications
- Centralized control (suitable for WirelessHUMAN)

Preliminary Assessment

- 802.15 PHY
 - Frequency Hopping
 - Current limitations on bit rates (1 Mbps)
 - Designed for 2.4 GHz ISM bands
- 802.15 MAC
 - Optimized for ad-hoc networking
 - Includes support for CBR
 - Designed for limited range applications

Preliminary Assessment

- 802.16.1 MAC
 - Not designed for interference in unlicensed bands
 - Designed for enterprise applications
 - Potential synergies based on common MAN requirements
- 802.16.1 PHY
 - Not designed for interference in unlicensed bands
 - Designed for above 11 GHz
 - Designed for LOS scenarios only

Preliminary Assessment

- HiperAccess PHY
 - Single carrier approach
 - Above 11 GHz
 - 28 MHz channel bandwidth
- HiperAccess MAC
 - TDMA based
 - Connection-oriented
 - guaranteed QoS
 - fixed length frame size and transmission slots
 - Supports FDD mainly, allows TDD for unpaired bands
 - Supports dynamic asymmetry for TDD
 - Adaptive modulation
 - Uses Convergence Layer to support multiple protocols

Preliminary Assessment

- HIPERLAN-2 PHY
 - Similar to 802.11a
- HIPERLAN-2 MAC
 - TDD based
 - ATM based solution
 - Support multiple CoS
 - centralized control
 - Assumes short propagation delay
 - Includes power control and dynamic frequency selection
 - Includes ARQ mechanism
 - Uses Convergence Layer to support multiple protocols