[Approved by IEEE 802.16 on 2000-11-08 and IEEE 802 on 2000-11-09]

IEEE-SA Standards Board Project Authorization Request (PAR) Form (2000-Rev 1)

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1. Sponsor Date of Request	2. Assigned Project Number	3. PAR Approval Date
2000 Nov 09	802.16.1b	

Copyright release must be submitted with appropriate signatures by FAX (1-732-562-1571)}

[ ] PAR Signature Page on File {IEEE Staff to check box}

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4. Project Title, Recorder and Working Group/Sponsor for this Project

Document type and title: {Place an X in only one option below}

- [x] **Standard for**{document stressing the verb "shall"}
- [ ] **Recommended Practice for**{document stressing the verb "should"}
- [ ] **Guide for** {document in which good practices are suggested}

Title: Telecommunications and Information Exchange Between Systems - LAN/MAN Specific Requirements - Air Interface for Fixed Broadband Wireless Access Systems including License-Exempt Frequencies

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

Name of Official Reporter (usually the WG Chair) who must be an SA member as well as an IEEE/Affiliate Member: Roger B. Marks

IEEE-Standards Staff has verified that the Official Reporter (or Working Group Chair) is an IEEE and an IEEE-SA member: [ ] (Staff to check box)

Contact Information:

Telephone	+1 303 497 3037	FAX:	+1 303 497 7828
E-mail:	r.b.marks@ieee.org		

Name of Working Group Chair (if different than Reporter): [ ]

IEEE-Standards Staff has verified that the Working Group Chair is an IEEE and an IEEE-SA member: [ ] (Staff to check box)

Contact Information:

Telephone	[ ]	FAX:	[ ]

E-mail: [ ]

Name of Sponsoring Society and Committee:	Computer Society, LAN/MAN Standards Committee; Microwave Theory and Techniques Society
Name of Committee Sponsor Chair:	Jim Carlo
IEEE-Standards Staff has verified that the Sponsor is an IEEE and an IEEE-SA member:	[ ] (Staff to check box)

Contact Information:

Telephone	+1 214 693-1776	FAX:	+1 214 853 5274
E-mail:	jcarlo@ti.com		

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5. Type of Project

a. Is this an update to an existing PAR? No

If YES, indicate PAR Number/Approval Date
If YES, is this project in ballot now?

b. Choose one from the following:

[ ] New Standard
[ ] Revision of existing Standard {number and year} [ ]
[x] Amendment (Supplement) to an existing standard {number and year} [802.16.1]
[ ] Corrigenda to an existing standard {number and year} [ ]

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6. Life Cycle

[x] Full Use (5-year life cycle)
[ ] Trial Use (2-year life cycle)

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7. Balloting Information

Choose one from the following:

[x] Individual Sponsor Balloting
[ ] Entity Sponsor Balloting
[ ] Mixed Balloting (combination of Individual and Entity Sponsor Balloting)

Expected Date of Submission for Initial Sponsor Ballot: [2001 Nov 19]

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8. Fill in Projected Completion Date for Submittal to RevCom [2002 Mar 31]

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9. Scope of Proposed Project:

This standard specifies the medium access control layer and physical layers of the air interface of interoperable fixed point-to-multipoint broadband wireless access systems. The specification enables transport of data, video, and voice services. Physical layers are specified for both licensed and license-exempt bands.

This Amendment expands the scope of the original project by extending it to license-exempt bands (thereby defining the Wireless High-Speed Unlicensed Metropolitan Area Network [**WirelessHUMAN™**] Standard). It specifies the physical layer and medium access control layer of the air interface of interoperable fixed broadband wireless metropolitan area network systems, including point-to-multipoint. The standard enables access to data, video, and voice services with quality of service in unlicensed (i.e., license-exempt) bands designated for public network access. It will focus on the 5-6 GHz range and may be applied to unlicensed bands between 2 and 11 GHz. It will address strategies for coexistence with other unlicensed applications. The project will utilize or modify applicable elements from the following:

- MAC: IEEE 802.16
- PHY: IEEE 802.11a; ETSI BRAN HIPERLAN/2

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10. Purpose of Proposed Project:

To enable rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products. To facilitate competition in broadband access by providing alternatives to wireline broadband access. To facilitate coexistence studies, encourage consistent worldwide allocation, and accelerate the commercialization of broadband wireless access spectrum.

This Amendment enhances the original project by extending it to license-exempt bands. It will identify techniques to tolerate interference in the unlicensed bands and facilitate strategies for coexistence with other unlicensed band systems such as 802.11 and 802.15. It will encourage consistent worldwide spectrum allocation and accelerate the commercialization of unlicensed broadband wireless access spectrum. Utilization of unlicensed frequencies will address a market that includes residences, small office-home office (SOHO), telecommuters, and small and medium enterprises (SME).

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11. Intellectual Property {Answer each of the questions below}

Are you aware of any patents relevant to this project?

[No] {Yes, with detailed explanation below / No}
[ ] {Explanation}

Are you aware of any copyrights relevant to this project?

[No] {Yes, with detailed explanation below / No}
[ ] {Explanation}

Are you aware of any trademarks relevant to this project?

[No] {Yes, with detailed explanation below / No}
[ ] {Explanation}

Are you aware of any registration of objects or numbers relevant to this project?

[No] {Yes, with detailed explanation below / No}
[ ] {Explanation}

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12. Are you aware of any other standards or projects with a similar scope?

Yes
{Explanation}

IEEE 802.11, ETSI HIPERLAN/2, and IEEE 802.15 standards and projects address primarily short range WLAN and WPAN applications, respectively. PACS-UA and PACS-UB address unlicensed operation in the unlicensed personal communication services (UPCS) bands at 1910-1930 MHz and 2390-2400 MHz. This Amendment is specifically directed towards wireless point-to-multipoint MAN/WAN systems that provide access to core public networks using the unlicensed band spectrum. These systems typically serve large numbers of dispersed subscribers.

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13. International Harmonization

Is this standard planned for adoption by another international organization? Yes
If Yes: Which International Organization ITU-R
If Yes: Include coordination in question 15 below
If No: Explanation [ ]

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14. Is this project intended to focus on health, safety or environmental issues?

No
If Yes: Explanation [ ]

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15. Proposed Coordination/Recommended Method of Coordination

Mandatory Coordination

SCC 10 (IEEE Dictionary)	by **DR**	{Circulation of **DR**afts}
IEEE Staff Editorial Review by	by **DR**	
SCC 14 (Quantities, Units and Letter symbols)	by **DR**	

Coordination requested by Sponsor:

ITU-R	by LI	{circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}

ETSI BRAN HIPERLAN/2	by LI	{circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}
.....	by [ ]	{circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}
.....	by [ ]	{circulation of **DR**afts/**LI**aison memb/**CO**mmon memb}

Coordination Requested by Others:

[ ] {added by staff}

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16. Additional Explanation Notes: {Item Number and Explanation}

The intended timetable is:
Nov 2000
Issue Call for Proposals for PHY and MAC
- PHY: Modifications of 802.11a and/or HIPERLAN/2
- MAC: Modifications of 802.16

Jan 2001
Review proposals
Feb 2001
Select Candidate Proposals at Interim Meeting
Mar 2001
Decision on specific modifications
May 2001
First Tentative Draft Standard submitted for review
July 2001
Comment Resolutions
Sep 2001
Second Tentative Draft Standard submitted for Letter Ballot
Nov 2001
Initiate Sponsor Ballot
Feb 2002
Submit to RevCom

The PAR Copyright Release and Signature Page must be submitted by FAX to 732-562-1571 before this PAR will be sent on for NesCom and Standards Board approval.

802.16 WirelessHUMAN™ PAR

Air Interface for Fixed Broadband Wireless Access Systems including License-Exempt Frequencies

Meeting the Five Criteria

1. Broad Market Potential

A standards project authorized by IEEE 802 shall have a broad market potential. Specifically, it shall have the potential for:

a) Broad sets of applicability

Broadband Access networks in the unlicensed microwave region are a rapidly emerging technology worldwide. Such networks have the potential to compete with copper- and cable-based systems in terms of capacity, and they offer the advantages of quick nationwide deployment and not requiring the installation of wired infrastructure. This is particularly advantageous in countries where the infrastructure is not widely deployed. In the US, the FCC allocation of 300 MHz of spectrum for U-NII applications and the popularity of unlicensed communication equipment in the ISM bands testifies to the growing level of interest in broadband wireless. Similar allocation of unlicensed frequencies in the microwave region (below 11 GHz) is occurring in many other countries with attendant interest by potential operators.

b) Multiple vendors and numerous users

The interest of many vendors and users is attested by the membership of the IEEE 802.16 WirelessHUMAN™ Study Group on Public MAN for Wireless Access in License Exempt Bands. Over 50 attendees, affiliated with 34 companies, attended the Study Group's meetings (see Appendix A). An additional 30 members, unable to attend the initial meetings, also expressed interest in the group.

Although broadband wireless access networks have only recently been deployed, many users are already on-line using proprietary systems (see Appendix B). It is estimated that over 250 million dollars worth of equipment will be sold this year to address unlicensed MAN applications. Rapid growth of new operators and multiple unlicensed networks in many locations creates the need for coordination and coexistence through standards.

c) Cost considerations (unlicensed versus licensed spectrum)

The use of unlicensed spectrum for wireless MAN applications has the potential for reduced operating cost and end user costs relative to licensed systems due the costs incurred from the purchase of licensed spectrum. The use of unlicensed spectrum is pre-approved on a nationwide basis and facilitates rapid service deployment leading to large market potential.

2) Compatibility

IEEE 802 defines a family of standards. All Standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802 Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.

Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.

The proposed standard will conform to the 802 Functional Requirements Document, with the possible exception of the Hamming distance.

3. Distinct Identity

Each 802 standard shall have a distinct identity. To achieve this, each authorized project shall be:

a) Substantially different from other IEEE 802 standards.

The WirelessHUMAN™ standard occupies a distinct place in the family of standards. It is intended to provide public access to metropolitan area networks operated by a service provider on unlicensed spectrum. These providers include traditional providers such as a local or inter exchange carrier or an ISP. In addition, the unlicensed nature of this network is expected to create new classes of service providers who do not have access to licensed spectrum. It also provides licensed service providers opportunities to expand service coverage, as well as create novel services by utilizing licensed and unlicensed spectrum in concert.

Compared to the IEEE 802.11 wireless LAN standard, the WirelessHUMAN™ standard needs to accommodate greater range and a cell-based architecture. Key differences include the need for sectorization and frequency reuse, the unique design criteria for MAN channel characteristics (delay spread, multipath, frame synchronization, etc), user traffic characteristics, and provision for interference control in MAN environments.

The WirelessHUMAN™ standard is expected to differ from the IEEE 802.16.1 air interface specification currently under development for higher frequencies due to differing target markets, frequency, bandwidth, regulatory requirements and propagation conditions.

The WirelessHUMAN™ standard is expected to differ from IEEE 802.16.3 because unlicensed MAN networks will require unique interference mitigation techniques (e.g. dynamic frequency selection, clear channel assessment, UPCS spectrum etiquette, etc) that are not required for licensed band operation. Furthermore, the bandwidth and regulatory requirements differ significantly.

b) One unique solution per problem.

The unique requirements of the WirelessHUMAN™ standard are not currently met by any existing standard in its entirety. Hence the WirelessHUMAN™ standard will utilize or modify applicable elements from the following:

MAC: 802.16

PHY: 802.11a; HIPERLAN/2

4) Technical feasibility

For a project to be authorized, it shall be able to show its technical feasibility.

The feasibility of radio systems at 2-11GHz has been demonstrated by proprietary systems operating in unlicensed bands now in operation in many cities worldwide.
Commercial deployment of unlicensed point-to-point and point-to-multipoint systems at microwave frequencies is evidence of proven technology.

5) Economic feasibility

a) Equipment

The economic feasibility of the equipment has already been demonstrated at the level of proprietary systems now going into operation. Standardization will encourage additional economies of scale and provide an avenue for cost reduction.

b) Network

Use of the unlicensed spectrum minimizes market entry costs to the service providers. The nationwide footprint also allows wider service coverage.

The use of such methods as point-to-multipoint communication provides substantial economies relative to earlier point-to-point technologies, particularly in handling data, which is characterized by high peak demands but bursty requirements overall. As demonstrated in many IEEE 802 standards over the years, such shared-media systems effectively serve users whose requirements vary over time, within the constraints of the total available data rate. The cost of a single base station is amortized over a large number of users.

c) Installation

Installation of any wireless customer-site system is relatively simple in that no offsite cabling need be installed. In contrast, with wireline networks the plant expense to connect the customer to the network is a very substantial part of the total cost and must be incurred for the first user in a coverage area. With wireless, the expenses can be incurred as customers come on-line. The siting of base stations is a more complex issue, but since one base station supports many users; the costs involved are very nominal on a per-user basis.

6) Coexistence

We have identified mutual coexistence of WirelessHUMAN^{TM} (High-Speed Unlicensed Metropolitan Area Networks), WLANs and WPANs as a critical success factor.

Appendix A:

The IEEE 802.16 WirelessHUMAN™ Study Group on Public MAN for Wireless Access in License Exempt Bands

The WirelessHUMAN™ Study Group has had attendance by over 50 participants affiliated with organizations including:

Adaptive Broadband
Agilent Technologies
BNA Systems
Breezecom
Cabletron
Cabletron systems
Carleton University
Carnegie Mellon University
Communications Research Center
Coreon Inc
Ericsson
Escape
Georgia Institute of Technology
HRL Laboratories, LLC
Harris Corporation
Innowave ECI
Intel
Intracom
Lucent
Magnolia Broadband
Malibu Networks
N Band Com
Nokia
Proxim
RF Solutions
RunCom
Sprint
Transcomm Inc.
Ultracom
WaveIP
Western Multiplex
Wireless Inc.
WirelessHome
Yokogawa Electric Co.

Appendix B:

Unlicensed MAN Product Manufacturers and Providers

In order to meet market demands, many manufacturers and providers have created and deployed unlicensed systems. A partial list of existing unlicensed MAN manufacturers and providers currently account for well over $250 million dollars annually.

A partial list of existing unlicensed MAN product manufacturers:

Adaptive Broadband
BreezeCOM
Cisco
Harris
Lucent
Malibu Networks
Nokia
P-COM
Proxim
WaveIP
WaveRider Communications
Western Multiplex
Wi-LAN
Wireless Home
Wireless, Inc.

A partial list of existing unlicensed MAN Service providers:

Airlinks
Allied River
Broadlink
ClearAccess
ClearWire Technologies
Cybertech
Fuzion
Interwireless
LMA Systems
Metricom
Netbeam
One Point Networks
SE Nets
SOHO Wireless
Urban Media
United Online