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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | Draft PAR and CSD: Amendment for fixed and mobile wireless access in channel sizes less than 1.25 MHz | |
| Date Submitted | 2015-09-10 | |
| Source(s) | Stewart Kantor, Guy Simpson (Full Spectrum)  Tim Godfrey (EPRI) | Note: This is a revision of IEEE 802.16-15-0037-00 as developed by the IEEE 802.16 GRIDMAN Task Group during its teleconference of 2015-09-09. |
| Re: | Call for Contributions; GRIDMAN Task Group: Narrower Channel Operation | |
| Abstract | This document consists of a proposed PAR and CSD for an amendment to IEEE Std 802.16 for operation in channel sizes less than 1.25 MHz | |
| Purpose | This proposal requests that the 802.16 WG reviews the proposal | |
| Notice | *This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups*. It represents only the views of the participants listed in the “Source(s)” field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who reserve(s) the right to add, amend or withdraw material contained herein. | |
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**Annex 1: Proposed Draft PAR for Narrowband Operation**

**Submitter Email: mshahar@fullspectrumnet.com**

**Type of Project:** Amendment to IEEE Standard 802.16-2012

**PAR Request Date:**

**PAR Approval Date:**

**PAR Expiration Date:**

**Status:**

**1.1 Project Number:** P802.16s

**1.2 Type of Document:**Standard

**1.3 Life Cycle:   
Full Use**

**2.1 PROJECT TITLE:**

**Standard for Air Interface for Broadband Wireless Access Systems**

**2.2 Amendment Title:**

Amendment for fixed and mobile wireless access in channel sizes less than 1.25 MHz

**3.1 Working Group:** Broadband Wireless Access Working Group (C/LM/WG802.16)

**Contact Information for Working Group Chair**

**Name:** Roger Marks

**Contact Information for Working Group Vice-Chair**

**Name:** Harry Bims

**3.2 Sponsoring Society and Committee:** IEEE Computer Society/LAN/MAN Standards Committee (C/LM)

**Contact Information for Sponsor Chair Name:**

**Name:** Paul Nikolich

**Contact Information for** **Standards Representative**

**Name:** James Gilb

**3.3 Joint Sponsor:** IEEE Microwave Theory and Techniques Society/Standards Coordinating Committee (MTT/SCC)

**Contact Information for Sponsor Chair**  
   **Name:** Michael Janezic  
**Contact Information for Standards Representative**  
   **Name:** Michael Janezic  
**4.1 Type of Ballot:**   
Individual

**4.2 Expected Date of submission of draft to the IEEE-SA for Initial Sponsor Ballot:**07/2016

**4.3 Projected Completion Date for Submittal to RevCom:**December 2016

**5.1 Approximate number of people expected to be actively involved in the development of this project:**   
15 [note: based on current distribution list / team participation]

**5.2.a. Scope of the complete standard:**   
This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support the WirelessMAN-SC, WirelessMAN-OFDM, and WirelessMAN-OFDMA PHY specifications, each suited to a particular operational environment.

**5.2.b. Scope of the project:**   
The project will amend Clause 12 of IEEE Std 802.16, adding a new WirelessMAN-OFDMA TDD system profile, and if necessary, minor consequential amendments to other clauses. This system profile will specify operation in exclusively-licensed spectrum with channel sizes less than 1.25 MHz, including 1 MHz explicitly.

**5.3 Is the completion of this standard dependent upon the completion of another standard:** No

**5.4 Purpose:**The amendment facilitates the development of innovative, cost-effective, and interoperable multivendor products for private licensed wireless access systems for mission critical networks. Applications include smart grids supporting generation, transmission, and distribution; field area networks; electric and gas utilities; smart fields and smart pipes for oil, gas and hazardous materials transport: intelligent transportation for rail and highway systems; and federal, state and local uses for homeland security and environmental and seismic monitoring.

**5.5 Need for the Project:**  
Mission critical entities have a strong preference for private, licensed networks in VHF/UHF frequencies for their data communications needs.

VHF/UHF licensed channels narrower than 1.25 MHz are readily available in the secondary markets at a lower cost than commercial wideband channels. Furthermore, VHF/UHF channels have superior propagation characteristics requiring less infrastructure and are capable of meeting capacity needs of private networks.

**5.6 Stakeholders for the Standard:**  
  
A) Stakeholders include the end users and customers in multiple markets, including electric and natural gas utilities, oil and gas companies, transportation including commercial and public rail, and public sector entities including federal state and local governments.

B) Equipment manufacturers also have an interest in standardized products to achieve economies of scale.

**Intellectual Property**

**6.1.a. Is the Sponsor aware of any copyright permissions needed for this project?:**  
No

**6.1.b. Is the Sponsor aware of possible registration activity related to this project?:**

**No**

**7.1 Are there other standards or projects with a similar scope?:** No

**7.2 Joint Development Is it the intent to develop this document jointly with another organization?:** No

**8.1 Additional Explanatory Notes (Item Number and Explanation):**

**Annex 2:** Proposed Draft CSD forfixed and mobile, point-to-multipoint access in channel sizes less than 1.25 MHz

**1.1 Project process requirements**

**1.1.1 Managed objects**

Describe the plan for developing a definition of managed objects. The plan shall specify one of the following:

The definitions will be part of this project.

1. The definitions will be part of a different project and provide the plan for that project or anticipated future project.
2. The definitions will not be developed and explain why such definitions are not needed. No new definitions are anticipated, as the existing ones will suffice.

**1.1.2 Coexistence**

A WG proposing a wireless project shall demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

1. Will the WG create a CA document as part of the WG balloting process as described in Clause 13? (yes/no)  
   No
2. If not, explain why the CA document is not applicable. The scope is to support operation in exclusively licensed spectrum.

**1.2 5C requirements**

**1.2.1 Broad Market Potential**

Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:

1. Broad sets of applicability.

This proposal addresses the multi-industry, multi-billion dollar worldwide market for private mission-critical data networks to support the Industrial Internet of Things (IIoT). This includes private licensed wireless networks for electric and natural gas utilities, oil and gas companies, commercial and public rail systems, and federal, state and local agencies for security and monitoring needs.

According to ABI Research, a leading information technology research and advisory company, the installed base of active wireless connected devices will grow from approximately 20 billion units today to 41 billion by 2020. The industrial vertical market, which includes utilities, manufacturing, and government, is forecasted to represent 12% of the devices or approximately 5 billion devices by 2020.

1. Multiple vendors and numerous users.

There is identified interest and support for the outcome of this project from individuals affiliated with the following: 1) leading industry support and research groups including the Utilities Telecom Council (UTC), the WiMAX Forum, and the Electric Power Research Institute (EPRI), 2) system integrators, 3) chip suppliers, 4) equipment manufacturers, 5) licensed spectrum holders, and 6) US electric utilities.

**1.2.2 Compatibility**

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

1. Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q?

Yes. The amendment will not affect the standard’s compliance with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q.

1. If the answer to a) is no, supply the response from the IEEE 802.1 WG.

The review and response is not required if the proposed standard is an amendment or revision to an existing standard for which it has been previously determined that compliance with the above IEEE 802 standards is not possible. In this case, the CSD statement shall state that this is the case.

**1.2.3 Distinct Identity**

Each proposed IEEE 802 LMSC standard shall provide evidence of a distinct identity. Identify standards and standards projects with similar scopes and for each one describe why the proposed project is substantially different.

Existing IEEE 802.16 profiles address wide channels of 1.25-20 MHz. This new project provides support for exclusively-licensed spectrum with channel sizes less than the existing minimum channel size of 1.25 MHz.

**1.2.4 Technical Feasibility**

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

1. Demonstrated system feasibility.

A proprietary system based on a variation of IEEE 802.16 technology has already been deployed successfully with various US utilities in channel sizes 1 MHz and smaller.

1. Proven similar technology via testing, modeling, simulation, etc.  
   At least five utilities in the US have either deployed or are testing a proprietary system based on a variation of IEEE 802.16 technology.

**1.2.5 Economic Feasibility**

Each proposed IEEE 802 LMSC standard shall provide evidence of economic feasibility. Demonstrate, as far as can reasonably be estimated, the economic feasibility of the proposed project for its intended applications. Among the areas that may be addressed in the cost for performance analysis are the following:

1. Balanced costs (infrastructure versus attached stations).  
   The proposed modifications, which include licensed VHF/UHF frequencies in narrower channels, allow many end users to leverage their existing Land Mobile Radio (LMR) infrastructure. This minimizes the investment in incremental tower and backhaul infrastructure for private wide areas networks. The type of applications that this amendment is intended to support have relatively low bandwidth requirements, and the networks are normally range-limited, not capacity-limited. The reduction in capacity resulting from the narrower channel size does not require a higher density of base stations to compensate. The cost balance between the Base Station and the Subscriber Station is therefore unaffected by the changes in this amendment for this application set.
2. Known cost factors.  
   Costs include licensed spectrum, base stations and remote stations and their associated antenna systems, and network management systems. VHF/UHF licensed channels narrower than 1.25 MHz are readily available in the secondary markets at a lower cost than commercial wideband channels.
3. Consideration of installation costs  
   Many utilities and mission critical entities already have existing LMR and backhaul infrastructure. Remote radios are typically co-located with existing assets (e.g. substations, utility poles, customer premises equipment). Licensed VHF/UHF frequencies enable non-line-of-sight installations below the clutter.
4. Consideration of operational costs (e.g., energy consumption).  
   Most mission critical entities already have infrastructure assets for both base stations and remotes and support teams to run these networks.
5. Other areas, as appropriate.