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| Title | **Proposed text for P802.16m requirements (802.16m-07/002r1) regarding backwards compatibility** |
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| Abstract | This document discusses the concerns raised in IEEE C802.16m-07/079 regarding issues associated with the backward compatibility text. To that end, this document discusses an appropriateness of the profile to serve as reference for backward compatibility. Finally, this document proposes text that addresses the remaining issues. |
| Purpose | Proposed text for IEEE 802.16m backwards compatibility |
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# Proposed text for P802.16m requirements (802.16m-07/002r1) regarding backwards compatibility

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IEEE 802.16m-07/002r1 attempts to define backward compatibility requirements consistent with industry efforts to certify equipment based on the IEEE 802.16 standard. The IEEE 802.16 working group must assure operators who are making or contemplating a large investment in IEEE 802.16 technologies that future IEEE 802.16m amendment will not obsolete the current generation of certified equipment. Moreover, the IEEE 802.16 working group should acknowledge the contribution the WiMAX Forum has made in their role as a certification body for IEEE 802.16 equipment.

In Orlando, contribution IEEE C802.16m-07/079 made some thoughtful comments regarding the language and the structure of the backward compatibility requirements. This contribution attempts to address those issues and propose text that overcomes those issues. Contribution IEEE C802.16m-07/079 identified the following issues:

1) The IEEE 802.16 standard as it exists does not contain complete compliance profiles making it impossible to discuss backwards compatibility. The standard must first define compliance profiles otherwise it is impossible to discuss backwards compatibility.
2) The existing language on backwards compatibility is "inherently faulty, awkward, inaccurate or ambiguous." The faults are characterized as follows:
    a. The term "802.16e" is ambiguous as it is not a complete standard. IEEE 802.16e is simply one amendment among many amendments to IEEE 802.16-2004.
    b. The term "802.16e" will soon be obsolete. The IEEE 802.16 revision project plans consolidate IEEE Standards 802.16-2004, 802.16e-2005, 802.16-2004/Cor1-2005, and 802.16f-2005 (and possibly 802.16g and 802.16i, if completed in time incorporating the P802.16-2004/Cor2 draft.). Once IEEE 802.16 revision project is complete 802.16e will be superseded by the new standard likely to be called IEEE 802.16-2007.
    c. The WiMAX Forum Mobile System Profile, proposed as a reference, identifies specific applications making some language particularly awkward. Contribution #79 cites a specific certification profile, TDD operation with 5/10 MHz, as an example which makes the statement "An IEEE 802.16m base station shall support… operation of IEEE 802.16e mobile stations with performance equivalent to an IEEE 802.16e base station" have undesired implications. Specifically, contribution #79 contends the statement implies that all IEEE 802.16m systems must operate in TDD mode.

Issue #1 suggests that IEEE 802.16 compliance profiles are necessary to discuss backwards compatibility. However, IEEE 802.16 must acknowledge that IEEE 802 has not and will never certify equipment as compliant with the IEEE 802.16 standard. In fact, IEEE 802 has long relied on external industry forums to provide that certification of vendor equipment. Since the completion of IEEE 802.16e/D12 in September 2005, the WiMAX Forum has been laboring to develop a certification regimen and establish certification labs to begin the certification of IEEE 802.16 equipment for mobile

applications. As part of the certification regimen, the WiMAX Forum has developed a mobile system profile which provides a suitable base for backward compatibility.

IEEE 802.16m-07/002r1 is a working group document capturing the requirements for the IEEE 802.16m amendment. IEEE 802.16m-07/002r1 is not an IEEE 802.16 standard and is not intended to exist as eternal reference. Rather, IEEE 802.16m-07/002r1 is intended to act as yardstick for the TGm as it develops the IEEE 802.16m amendment. Moreover, it is not absolutely necessary that IEEE 802.16m amendment contain explicit statements about backwards compatibility. Rather, it is more important that the features, functions and procedure defined in IEEE 802.16m are backward compatible with the features, functions and procedures in IEEE 802.16e-2005 employed by the WiMAX Forum certified devices. The backward compatibility statement in the TGm requirements must capture the intended relationship between legacy IEEE 802.16 certified devices and 802.16m certified devices. This backwards compatibility statement will shape the features, functions and procedures captured in the IEEE 802.16m amendment.

The definition of profiles in the IEEE 802.16 standard, either 16e or 16m, are not a pre-requisite for making unambiguous backward compatibility statement in the TGm requirement document. As IEEE 802.16e profile does not today contain a profile, forcing the definition of such profile in the backward compatibility statement would only serve to delay the standardization of IEEE 802.16m. Whether the WiMAX Forum mobile system profile should be adopted as part of the revision project is a separate issue and should be debated within the maintenance task group. In the meantime, TGm should be allowed to commence standard development with all possible speed. The TGm backwards compatibility statement should be drafted without further debate on non-existent IEEE 802.16e profiles.

Issue #2a raises a reasonable point regarding the ambiguity of term “802.16e”. However, within context of the working group and in light of the WiMAX Forum Mobile System Profile offered as reference, the term is reasonably unambiguous over the foreseeable duration of TGm development. In any case, the term “WirelessMAN-OFDMA Reference System” is offered as a remedy to this objection. WirelessMAN-OFDMA is preferred as it is consistent with the language in the PAR regarding legacy support. It should be noted the WirelessMAN-OFDMA Reference System is only intended to be an ephemeral term used by the TGm task group in its development of features, functions and procedures captured in the IEEE 802.16m amendment.

Issue #2b raises the issues that term IEEE 802.16e will soon be obsolete. This is irrelevant since it is only used in a working group requirements document which itself will be obsolete. IEEE 802.16 based equipment soon to be certified by the WiMAX Forum and deployed by operators will forever be tied to the IEEE 802.16e-2005 standard. It is impossible to certify a system against some future standard. The goal of backward compatibility is to inter-operate with existing equipment based on historic/obsolete standard and there is no avoiding that. None-the-less, this objection is somewhat mitigated by the use of the term WirelessMAN-OFDMA.

Issue #2c is the most cogent objection as the WiMAX Forum Mobile System Profile identifies a limited number of certification profiles for specific frequency bands all employing TDD. The precise implications for potential future certification profiles having different operating frequencies and duplexing methods are unclear. However, given any configuration based on IEEE 802.16m will continue to carry the Wirelessman-OFDMA moniker, it is reasonable to assume that there will/shall be significant commonality between these new certification profiles. It is recommended that the features for future WirelessMAN-OFDMA certification profiles be identical to those employed in IEEE 802.16m configurations which are backwards compatible with the Wireless-MAN-OFDMA Reference

System unless a necessary accommodation is needed to address the physical realities of that configuration. Such physical realities may reflect the issues associated with FDD system due to lack of reciprocity or the parameterization necessary for efficient operation at lower operating frequencies.

## *Proposed Text for Section 1.0*

The P802.16m draft shall be developed in accordance with the P802.16 project authorization request (PAR), as approved on 6 December 2007 <http://standards.ieee.org/board/nes/projects/802-16m.pdf>, and with the Five Criteria Statement in IEEE 802.16-06/055r3 <http://ieee802.org/16/docs/06/80216-06_055r3.pdf>.

According to the PAR, the standard shall be developed as an amendment to IEEE Std 802.16. The scope of the resulting standard shall fit within the following scope:

> *This standard amends the IEEE 802.16 WirelessMAN-OFDMA specification to provide an advanced air interface for operation in licensed bands. It meets the cellular layer requirements of IMT-Advanced next generation mobile networks. This amendment provides continuing support for legacy WirelessMAN-OFDMA equipment.*

And the standard will address the following purpose:

> *The purpose of this standard is to provide performance improvements necessary to support future advanced services and applications, such as those described by the ITU in Report ITU-R M.2072.*

The standard is intended to be a candidate for consideration in the IMT-Advanced evaluation process being conducted by the International Telecommunications Union– Radio Communications Sector (ITU-R).

This document represents the high-level system requirements for the P802.16m draft. All content included in any P802.16m draft shall meet these requirements. This document, however, shall be maintained and may evolve. If a proponent wishes to propose material for the P802.16m draft that is not in compliance with this document, the proponent is advised to first initiate a discussion on the revision of this requirements document.

These system requirements embodied herein are defined to ensure competitiveness of the evolved air interface with respect to other mobile broadband radio access technologies as well as to ensure support and satisfactory performance for emerging services and applications. These system requirements also call for significant gains and improvements relative to the preexisting IEEE 802.16 system that would justify the creation of the advanced air interface.

To accelerate the completion and evaluation of the standard, to improve the clarity and reduce complexity of the standard specification, and to further facilitate the deployment of new systems, the number of optional features shall be limited to a minimum.

## *Proposed Text for Section 3.0 Definitions*

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| Sector | This term refers to physical partitioning of the base station (BS). When there are N transmitting directional antennas in the BS, each of them is named a sector. |
| Cell | A collection of sectors (typically 3) belonging to the same base station. |
| WirelessMAN-OFDMA Reference System | A system compliant with a subset of the WirelessMAN-OFDMA capabilities specified by IEEE 802.16-2004 and amended by IEEE 802.16e-2005, where the subset is defined by the WiMAX Forum™'s Mobile System Profile, Release 1.0 Approved Specification [1]. |
| Legacy Mobile Station | A mobile station compliant with the WirelessMAN-OFDMA Reference System. |
| Legacy Base Station | A base station compliant with the WirelessMAN-OFDMA Reference System. |

## *Proposed Text for Section 5.1 Legacy Support*

The IEEE 802.16m amendment is based on the IEEE Standard 802.16 WirelessMAN-OFDMA specification.

IEEE 802.16m shall provide continuing support and interoperability for legacy WirelessMAN-OFDMA equipment, including base stations and mobile stations. Specifically, the features, functions and procedures enabled in the IEEE 802.16m shall support the features, functions and procedures employed by WirelessMAN-OFDMA legacy equipment.

This continuing support shall be limited to only a "harmonized sub-set" of WirelessMAN-OFDMA features. This harmonized sub-set is captured by the WiMAX Forum™'s Mobile System Profile, Release 1.2 Approved Specification [1]. The features, functions and procedures specified by WiMAX Mobile System Profile shall serve as the WirelesMAN-OFDMA Reference System for the purposes of the backwards compatibility requirement captured in this document. In this document, a "Legacy MS" is defined as a MS that is compliant with the Wireless-OFDMA Reference System. Similarly, a "Legacy BS" is defined as a BS that is compliant with the Wireless-OFDMA Reference System

The following requirements are applicable to IEEE 802.16m equipment when operating in the frequency bands defined by the Wireless-MAN OFDMA Reference System:

- An 802.16m MS shall be able to operate with a Legacy BS, at a level of performance equivalent to that of a legacy MS.
- Systems based 802.16m and the Wireless-OFDMA Reference System shall be able to operate on the same RF carrier.
- An 802.16m BS shall support a mix of 802.16m and Legacy MSs. The performance of such an 802.16m system should be proportional to the fraction of 802.16m MSs attached to the BS.
- An IEEE 802.16m BS shall support seamless handover of a Legacy MS to and from Legacy BS

IEEE 802.16m systems shall be able to operate in bands and configurations not specified by the WirelessMAN-OFDMA Reference System. The features, functions and procedures for other configurations shall be identical to those employed in IEEE 802.16m configurations which are backwards compatible with the Wireless-MAN-OFDMA Reference System unless a necessary accommodation is needed to address the physical constraint of that particular configuration such as FDD system due to lack of reciprocity or the parameterization necessary for efficient operation at lower operating frequencies.