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| **Radiocommunication Study Groups** |  |
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| Received: 4 June 2014  Subject: Recommendation ITU-R M.1457 | **Document 5D/648-E** |
| **4 June 2014** |
| **English only  TECHNOLOGY ASPECTS** |
| Institute of Electrical and Electronics Engineers, Inc. | |
| Update of SECTION 5.6 toward Revision 12 of Recommendation ITU-R M.1457 (Meeting X+2B Notification) | |
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# 1 Source information

This contribution was developed by IEEE Project 802®, the Local and Metropolitan Area Network Standards Committee (“IEEE 802”), an international standards development committee organized under the IEEE and the IEEE Standards Association (“IEEE-SA”).

The content herein was approved for submission by the IEEE 802.16™ Working Group on Wireless Metropolitan Area Networks, the IEEE 802.18 Radio Regulatory Technical Advisory Group, and the IEEE 802 Executive Committee, in accordance with the IEEE 802 policies and procedures, and represents the view of IEEE 802.

# 2 Discussion

This contribution responds to the 18 February 2013 “Liaison statement to External Organizations engaged in Recommendation ITU‑R M.1457 on plans to replace the Circular Letter 8/LCCE/95 process for the IMT‑2000 updates of Recommendation ITU-R M.1457 with an adaptation of the IMT‑Advanced update process developed for Recommendation ITU-R M.2012” (Attachment 5.18 to Document 5D/300).

This contribution is a followup to IEEE’s “Meeting X” contribution (Document 5D/361) and “Meeting X+1” contribution (Document 5D/447) toward the development of Revision 12 of Recommendation ITU‑R M.1457.

GCS Proponent IEEE proposes revision of Section 5.6 toward Revision 12 of Recommendation ITU‑R M.1457 according to the schedule of IMT-2000/5. The proposal involves modification of the GCS. Accordingly, per IMT-2000/5, material are supplied as addressed in the following annexes:

Annex 1: Summary and rationale of proposed update

Annex 2: Update of Section 5.6.1

Annex 3: Updated GCS, Certification B, Certification C

Annex 4: Self-evaluation of the proposed update against the evaluation criteria

Annex 5: Update of Section 5.6.2, including Transposition References provided by Transposing Organization IEEE

# 3 Proposal

We propose that the information contained in this contribution be agreed for incorporation in Revision 12 of Recommendation ITU-R M.1457.

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Annex 1

Summary and rationale of proposed update

The update is intended to align Recommendation ITU-R M.1457 to the current versions of the specifications underlying the radio interface IMT-2000 OFDMA TDD WMAN. The update of Section 5.6 accounts for the following amendments to IEEE Std 802.16 and IEEE Std 802.16.1:

* IEEE Std 802.16p-2012 (First Amendment to IEEE Std 802.16-2012): Enhancements to Support Machine-to-Machine Applications
* IEEE Std 802.16n-2012 (Second Amendment to IEEE Std 802.16-2012): Higher Reliability Networks
* IEEE Std 802.16.1b-2013 (First Amendment to IEEE Std 802.16.1-2012): Enhancements to Support Machine-to-Machine Applications
* IEEE Std 802.16.1a-2013 (First Amendment to IEEE Std 802.16.1-2012): Higher Reliability Networks

All of these IEEE standards have been approved and published.

Annex 2

Update of Section 5.6.1

No update of Section 5.6.1 of Rec. ITU-R M.1457-11 is proposed toward Rec. ITU-R M.1457-12.

Annex 3

Updated GCS, Certification B, Certification C

The updated set of the Global Core Specifications (GCS) for IMT-2000 OFDMA TDD WMAN, and Certification B, are provided separately by GCS Proponent IEEE per established procedures. Certification C is provided separately by Transposing Organization IEEE per established procedures.

Annex 4

Self-evaluation of the proposed update against the evaluation criteria

The self-evaluation of the “total” radio interface update of IMT-2000 OFDMA TDD WMAN has been made as per document IMT-2000/4, specifically Circular Letter 8/LCCE/47 and its Attachments, given that the full context of the total terrestrial radio interface is considered to be the original submission and any previously approved updates as well as this proposed update. As shown in the tables below, the conclusion is that IMT-2000 OFDMA TDD WMAN with the proposed enhancements continue to meet all evaluation criteria in “Requirements and objectives of IMT‑2000” and “Minimum performance capabilities for IMT-2000”.

TABLE 1

Requirements and objectives relevant to the evaluation   
of candidate radio transmission technologies

| IMT-2000 Item Description | Obj/Req | Source | Meets |
| --- | --- | --- | --- |
| Voice and data performance requirements | | | |
| 1. One-way end to end delay less than 40 ms | Req | G.174, § 7.5 | Yes |
| 2. For mobile videotelephony services, the IMT-2000 terrestrial component should operate so that the maximum overall delay  (as defined in Recommendation ITU-T F.720) should not exceed 400 ms, with the one way delay of the transmission path not exceeding 150 ms | Req | Suppl. F.720, F.723, G.114 | Yes |
| 3. Speech quality should be maintained during < 3% frame erasures over any 10 second period. The speech quality criterion is a reduction of < 0.5 mean opinion score unit (5 point scale) relative to the error-free condition (G.726 at 32 kbit/s) | Req | G.174, § 7.11 and M.1079 § 7.3.1 | Yes |
| 4. DTMF signal reliable transport (for PSTN is typically less than one DTMF error signal in 104) | Req | G.174, § 7.11 and M.1079 § 7.3.1 | Yes |
| 5. Voiceband data support including G3 facsimile | Req | M.1079 § 7.2.2, | Yes |
| 6. Support packet switched data services as well as circuit switched data; requirements for data performance given in Recommendation ITU-T G.174 | Req | M.1034 §§ 10.8, 10.9 | Yes |

| IMT-2000 Item Description | Obj/Req | Source | Meets |
| --- | --- | --- | --- |
| **Radio interfaces and subsystems, network related performance requirements** | | | |
| 7. Network interworking with PSTN and ISDN in accordance  with Q.1031 and Q.1032 | Req | M.687-1. § 5.4 | Yes |
| 8. Meet spectral efficiency and radio channel performance requirements of Recommendation ITU-R M.1079 | Req | M.1034. § 12.3.3/4 | Yes |
| 9. Provide phased approach with data rates up to 2 Mbit/s in phase 1 | Obj | M.687, § 1.1.14 | Yes |
| 10. Maintain bearer channel bit-count integrity (e.g. synchronous data services and many encryption techniques) | Obj | M.1034, § 10.12 | Yes |
| 11. Support for different cell sizes, for example:  Mega cell Radius~100-500 km  Macro cell Radius < 35 km, Speed < 500 km/h  Micro cell Radius < 1 km, Speed < 100 km/h  Pico cell Radius < 50 m, Speed < 10 km/h | Obj | M.1035, § 10.1 | Yes |
| **Application of IMT-2000 for fixed services and developing countries** | | | |
| 12. Circuit noise- idle noise levels in 99% of the time about 100 pWp | Obj | M.819-1, § 10.3 | Yes |
| 13. Error performance – as specified in Recommendation ITU‑R F.697 | Obj | M.819-1, § 10.4 | Yes |
| 14. Grade of service better than 1% | Obj | M.819-1, § 10.5 | Yes |

TABLE 2

Generic requirements and objectives relevant to the evaluation of   
candidate radio transmission technologies

| IMT-2000 Item Description | Obj/Req | Source | Meets |
| --- | --- | --- | --- |
| Radio interfaces and subsystems, network related performance requirements | | | |
| 1. Security comparable to that of PSTN/ISDN | Obj | M.687-1, § 4.4 | Yes |
| 2. Support mobility, interactive and distribution services | Req | M.816, § 6 | Yes |
| 3. Support UPT and maintain common presentation to users | Obj | M.816, § 4 | Yes |
| 4. Voice quality comparable to the fixed network (applies to both mobile and fixed service) | Req | M819-1, Table 1, M.1079, § 7.1 | Yes |
| 5. Support encryption and maintain encryption when roaming and during handover | Req | M.1034 § 11.3 | Yes |
| 6. Network access indication similar to PSTN (e.g. dialtone) | Req | M.1034 §§ 11.5 | Yes |
| 7. Meet safety requirements and legislation | Req | M.1034, § 11.6 | Yes |
| 8. Meet appropriate EMC regulations | Req | M.1034, § 11.7 | Yes |
| 9. Support multiple public/private/residential IMT-2000 operators in the same locality | Req | M.1034, § 12.1.2 | Yes |
| 10. Support multiple mobile station types | Req | M.1034, § 12.1.4 | Yes |
| 11. Support roaming between IMT-2000 operators and between different IMT-2000 radio interfaces/environments | Req | M.1034, § 12.2.2 | Yes |
| 12. Support seamless handover between different IMT-2000 environments such that service quality is maintained and signaling is minimized | Req | M.1034, § 12.2.3 | Yes |
| 13. Simultaneously support multiple cell sizes with flexible base location, support use of repeaters and umbrella cells as well as deployment in low capacity areas | Req | M.1034, § 12.2.5 | Yes |
| 14. Support multiple operator coexistence in a geographic area | Req | M.1034, § 12.2.5 | Yes |
| 15. Support different spectrum and flexible band sharing in different countries including flexible spectrum sharing between different IMT-2000 operators (see Recommendation ITU-R M.1036) | Req | M.1034, § 12.2.8 | Yes |
| 16. Support mechanisms for minimizing power and interference between mobile and base stations | Req | M.1034, § 12.2.8.3 | Yes |
| 17. Support various cell types dependent on environment  (Recommendation ITU-R M.1035 § 10.1) | Req | M.1034, § 12.2.9 | Yes |
| 18. High resistance to multipath effects | Req | M.1034, § 12.3.1 | Yes |
| 19. Support appropriate vehicle speeds (as per § 7) NOTE − Applicable to both terrestrial and satellite proposals | Req | M.1034. § 12.3.2 | Yes |
| 20. Support possibility of equipment from different vendors | Req | M.1034, § 12.1.3 | Yes |
| 21. Offer operational reliability at least as good as 2nd generation mobile systems | Req | M.1034, § 12.3.5 | Yes |
| 22. Ability to use terminal to access services in more than one environment, desirable to access services from one terminal in all environments | Obj | M.1035, § 7.1 | Yes |
| 23. End-to-end quality during handover comparable to fixed services | Obj | M.1034-1 § 11.2.3.4 | Yes |
| 24. Support multiple operator networks in a geographic area without requiring time synchronization | Obj |  | Yes |
| 25. Layer 3 contains functions such as call control, mobility management and radio resource management some of which are radio dependent. It is desirable to maintain layer 3 radio transmission independent as far as possible | Obj | M.1035, § 8 | Yes |
| 26. Desirable that transmission quality requirements from the upper layer to physical layers be common for all services | Obj | M.1035, § 8.1 | Yes |
| 27. The link access control layer should as far as possible not contain radio transmission dependent functions | Obj | M.1035, § 8.3 | Yes |
| 28. Traffic channels should offer a functionally equivalent capability to the ISDN B channels | Obj | M.1035, § 9.3.2 | Yes |

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| --- | --- | --- | --- |
| **IMT-2000 Item Description** | **Obj/Req** | **Source** | **Meets** |
| 29. Continually measure the radio link quality on forward and reverse channels | Obj | M.1035, § 11.1 | Yes |
| 30. Facilitate the implementation and use of terminal battery saving techniques | Obj | M.1035, § 12.5 | Yes |
| 31. Accommodate various types of traffic and traffic mixes | Obj | M.1036, § 1.10 | Yes |
| **Application of IMT-2000 for fixed services and developing countries** | | | |
| 32. Repeaters for covering long distances between terminals and base stations, small rural exchanges with wireless trunks etc. | Req | M.819-1, Table 1 | Yes |
| 33. Withstand rugged outdoor environment with wide temperature and humidity variations | Req | M.819-1, Table 1 | Yes |
| 34. Provision of service to fixed users in either rural or urban areas | Obj | M.819-1, § 4.1 | Yes |
| 35. Coverage for large cells (terrestrial) | Obj | M.819-1, § 7.2 | Yes |
| 36. Support for higher encoding bit rates for remote areas | Obj | M.819-1, § 10.1 | Yes |
| **Satellite component (Not required for RTT submission)** | | | |
| 37. Links between the terrestrial and the satellite control elements for handover and exchange of other information | Req | M.818-1, § 3.0 | N/A |
| 38. Take account for constraints for sharing frequency bands with other services (WARC-92) | Obj | M.818-1, § 4.0 | N/A |
| 39. Compatible multiple access schemes for terrestrial and satellite components | Obj | M.818-1, § 6.0 | N/A |
| 40. Service should be comparable quality to terrestrial component as far as possible | Obj | M.818-1, § 10.0 | N/A |
| 41. Use of satellites to serve large cells for fixed users | Obj | M.819-2, § 7.1 | N/A |
| 42. Key features (e.g. coverage, optimization, number of systems) | Obj | M.1167, § 6.1 | N/A |
| 43. Radio interface general considerations | Req | M.1167, § 8.1.1 | N/A |
| 44. Doppler effects | Req | M.1167, § 8.1.2 | N/A |

TABLE 3

Subjective requirements and objectives relevant to the evaluation of candidate   
radio transmission technologies

|  |  |  |  |
| --- | --- | --- | --- |
| IMT-2000 Item Description | Obj/Req | Source | Meets |
| 1. Fixed service – Power consumption as low as possible for solar and other sources | Req | M.819-1. Table 1 | Yes |
| 2. Minimize number of radio interfaces and radio sub-system complexity, maximize commonality (Recommendation ITU‑R M.1035, § 7.1) | Req | M.1034, § 12.2.1 | Yes |
| 3. Minimize need for special interworking functions | Req | M.1034, § 12.2.4 | Yes |
| 4. Minimum of frequency planning and inter-network coordination and simple resource management under time‑varying traffic | Req | M.1034, § 12.2.6 | Yes |
| 5. Support for traffic growth, phased functionality, new services  or technology evolution | Req | M.1034, § 12.2.7 | Yes |
| 6. Facilitate the use of appropriate diversity techniques avoiding significant complexity if possible | Req | M.1034, § 12.2.10 | Yes |
| 7. Maximize operational flexibility | Req | M.1034, § 12.2.11 | Yes |
| 8. Designed for acceptable technological risk and minimal  impact from faults | Req | M.1034, § 12.2.12 | Yes |
| 9. When several cell types are available, select the cell that  is the most cost and capacity efficient | Obj | M.1034, § 10.3.3 | Yes |
| 10. Minimize terminal costs, size and power consumption,  where appropriate and consistent with other requirements | Obj | M.1036, § 1.12 | Yes |

TABLE 4

Minimum performance capabilities

|  |  |  |  |
| --- | --- | --- | --- |
| Test environments | Indoor office | Outdoor to indoor and pedestrian | Vehicular |
| **Mobility considerations** | mobility type (low) | mobility type (medium) | mobility type (high) |
| Handover | Yes | Yes | Yes |
| **Support of general service capabilities** |  |  |  |
| Packet data | Yes | Yes | Yes |
| Asymmetric services | Yes | Yes | Yes |
| Multimedia | Yes | Yes | Yes |
| Variable bit rate | Yes | Yes | Yes |

Annex 5

Update of Section 5.6.2, including Transposition References

The content below is intended to replace Section 5.6.2 of Rec. ITU-R M.1457-11 toward Rec. ITU‑R M.1457-12. Transposition references of Transposing Organization IEEE are incorporated, in advance of WP 5D Meeting #20.

5.6.2 Detailed specification of the set of radio interface FDD/TDD components

5.6.2.1 TDD component

The standards contained in this section are derived from the global core specifications for IMT2000 contained at http://ties.itu.int/u/itu-r/ede/rsg5/IMT-2000/GCS/GCSrev12. Only the specifications listed below are relevant to this Recommendation.

The following notes apply to the sections below, where indicated:

1. The relevant SDOs should make their reference material available from their website.

2. This information was supplied by the recognized external organizations and relates to their own deliverables of the transposed global core specification.

The entries in the Tables in the elements of § 5.6.2.1.x.2 that contain “Y” or interoperable options (IO-BF or IO-MIMO) are part of the detailed specifications for OFDMA TDD WMAN. The “N” entries in the Tables in the elements of § 5.6.2.1.x.2 are for information only and are not included in the OFDMA TDD WMAN specification. The specifications for OFDMA TDD WMAN are provided in the elements of § 5.6.2.1.x.1 that are specifically included in the corresponding elements of § 5.6.2.1.x.2. Anything in § 5.6.2.1.x.1 that is not mentioned in § 5.6.2.1.x.2 is excluded.

5.6.2.1.1 Release 1

5.6.2.1.1.1 IEEE Std 802.16: Standard for local and metropolitan area networks – Air interface for broadband wireless access systems

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 multiple PHY specifications, each suited to a particular operational environment.

5.6.2.1.1.1.1 IEEE Std 802.16-2004

IEEE Standard for local and metropolitan area networks – Part 16: Air interface for fixed broadband wireless access systems

This revised standard specifies the air interface, including the medium access control layer and multiple physical layer specifications, of fixed BWA systems supporting multiple services. It consolidates IEEE Std 802.16™, IEEE Std 802.16a™, and IEEE Std 802.16c™, retaining all modes and major features without adding modes. Content is added or revised to improve performance, ease deployment, or replace incorrect, ambiguous, or incomplete material, including system profiles.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2004 | Published; superseded byIEEE Std 802.16-2009 | 20041001 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.1.1.1.2 IEEE Std 802.16e-2005 and Cor1

IEEE Standard for local and metropolitan area networks – Part 16: Air interface for fixed and mobile broadband wireless access systems – Amendment 2: Physical and medium access control layers for combined fixed and mobile operation in licensed bands

This document provides enhancements to IEEE Std 802.16-2004 to support subscriber stations moving at vehicular speeds and thereby specifies a system for combined fixed and mobile broadband wireless access. Functions to support higher layer handover between base stations or sectors are specified. Operation is limited to licensed bands suitable for mobility below 6 GHz. Fixed IEEE 802.16 subscriber capabilities are not compromised. In addition to mobility enhancements, this document contains substantive corrections to IEEE 802.16-2004 regarding fixed operation.

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE 802.16e2005 and Cor1 | Published; superseded byIEEE Std 802.16-2009 | 2006-02-28 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.1.1.1.3 IEEE Std 802.16f-2005

IEEE Standard for local and metropolitan area networks – Part 16: Air interface for fixed broadband wireless access systems – Amendment 1: Management information base)

This document provides enhancements to IEEE Std 802.16-2004 to define a management information base (MIB) for the MAC and PHY and associated management procedures.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16f-2005 | Published; superseded byIEEE Std 802.16-2009 | 2005-12-01 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.1.1.2 WiMAX Forum® Profile

The complete WiMAX Forum® Mobile System Profile, Release 1 is included in the following volume.

5.6.2.1.1.2.1 WiMAX Forum® Mobile System Profile Release 1 – IMT-2000 Edition

This provides the complete WiMAX Forum® Mobile System Profile, Release 1.

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R010v11 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R010v11_MSP.pdf> |
| WiMAX Forum | WMF-T23-007-R010v02 | Published | 2009-08-01 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2009/07/WMF-T23-007-R010v02_MSP-IMT-2000.pdf> |

5.6.2.1.2 Release 1.5

5.6.2.1.2.1 IEEE Std 802.16: Standard for Air Interface for Broadband Wireless Access Systems

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 multiple PHY specifications, each suited to a particular operational environment.

5.6.2.1.2.1.1 IEEE Std 802.16-2009

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems

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 multiple PHY specifications, each suited to a particular operational environment.

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2009 | Published | 2009-05-29 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.1.2.1.2 IEEE Std 802.16j-2009

Multihop Relay Specification

This amendment updates and expands IEEE Std 802.16-2009, specifying physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations. Subscriber station specifications are not changed.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16j-2009 | Published | 2009-06-12 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.1.2.1.3 IEEE Std 802.16-2012

Standard for Air Interface for Broadband Wireless Access Systems

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.

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/80216Rev3.html> |

5.6.2.1.2.2 WiMAX Forum® Profile

The complete WiMAX Forum® Mobile System Profile, Release 1.5 is included in the following volumes.

5.6.2.1.2.2.1 WiMAX Forum® Mobile System Profile Specification: Release 1.5 – Common part

This specification describes the features of the WiMAX Forum® Mobile System Profile, Release 1.5. It includes the features common to both the TDD and FDD operational modes. It has the following table of contents:

1 Scope

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

2 References

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

3 Definitions

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

4 PHY profile

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

5 MAC profile

|  |  |  |  |  |
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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

6 Security

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

5.6.2.1.2.2.2 WiMAX Forum® Mobile System Profile specification: Release 1.5 – TDD specific part

This specification describes the features of the WiMAX Forum® Mobile System Profile, Release 1.5. It includes the features specific to the TDD operational mode. The content refers to the physical layer.

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| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-002-R015v01 | Published | 2009-08-01 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2009/07/WMF-T23-002-R015v01_MSP-TDD.pdf> |

5.6.2.1.2.2.3 WiMAX Forum® Mobile Radio Specification: Release 1.5

This specification describes the radio features of the WiMAX Forum® Mobile Radio Specification, Release 1.5.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-005-R015v06 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-005-R015v06_RSP.pdf> |

5.6.2.1.3 Release 2

5.6.2.1.3.1 IEEE Std 802.16-2012

Standard for Air Interface for Broadband Wireless Access Systems

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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/80216Rev3.html> |

5.6.2.1.3.1.1 IEEE Std 802.16p-2012

Standard for Air Interface for Broadband Wireless Access Systems — Amendment 1: Enhancements to Support Machine-to-Machine Applications

This amendment to IEEE Std 802.16-2012 specifies enhancements to provide improved support for machine-to-machine applications.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16p-2012 | Approved | 2012-08-30 | http://ieee802.org/16/pubs/80216p.html |

5.6.2.1.3.1.2 IEEE Std 802.16n-2013

Standard for Air Interface for Broadband Wireless Access Systems — Amendment 2: Higher Reliability Networks

This amendment to IEEE Std 802.16-2012, as previously amended by IEEE Std 802.16p-2012, specifies enhancements to support higher reliability networks.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16n-2013 | Approved | 2013-03-06 | http://ieee802.org/16/pubs/80216n.html |

5.6.2.1.3.2 IEEE Std 802.16.1-2012

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems

This standard specifies the WirelessMAN-Advanced air interface, including the medium access control layer (MAC) and physical layer (PHY), of a broadband wireless access (BWA) system supporting multiple services. The WirelessMAN-Advanced air interface supports ITU’s IMT‑Advanced requirements.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/802161.html> |

5.6.2.1.3.2.1 IEEE Std 802.16.1b-2012

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems — Amendment 1: Enhancements to Support Machine-to-Machine Applications

This amendment to IEEE Std 802.16.1-2012 specifies enhancements to provide improved support for machine-to-machine applications.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1b-2012 | Approved | 2012-08-30 | http://ieee802.org/16/pubs/802161b.html |

5.6.2.1.3.2.2 IEEE Std 802.16.1a-2013

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems — Amendment 2: Higher Reliability Networks

This amendment to IEEE Std 802.16.1-2012, as previously amended by IEEE Std 802.16.1b-2012, specifies enhancements to support higher reliability networks.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1a-2013 | Approved | 2013-03-06 | http://ieee802.org/16/pubs/802161a.html |

5.6.2.1.3.3 WiMAX Forum® Profile

5.6.2.1.3.3.1 WiMAX Forum® Mobile System Profile – Release 2.0

This provides the complete WiMAX Forum® Mobile System Profile – Release 2.0

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R020v02 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R020v02_MSP.pdf> |

5.6.2.1.3.3.2 WiMAX Forum® Mobile Radio Specifications – Release 2.0

This provides the complete WiMAX Forum® Mobile Radio Specifications – Release 2.0

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-005-R020v01 | Published | 2012-05-18 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/05/WMF-T23-005-R020v01_RSP.pdf> |

5.6.2.2 FDD component

The standards contained in this section are derived from the global core specifications for IMT2000 contained at http://ties.itu.int/u/itu-r/ede/rsg5/IMT-2000/GCS/GCSrev12. Only the specifications listed below are relevant to this Recommendation.

The following notes apply to the sections below, where indicated:

1. The relevant SDOs should make their reference material available from their website.

2. This information was supplied by the recognized external organizations and relates to their own deliverables of the transposed global core specification.

The entries in the Tables in the elements of § 5.6.2.2.x.2 that contain “Y” or interoperable options (IO-BF or IO-MIMO) are part of the detailed specifications for OFDMA TDD WMAN. The “N” entries in the Tables in the elements of § 5.6.2.2.x.2 are for information only and are not included in the OFDMA TDD WMAN specification. The specifications for OFDMA TDD WMAN are provided in the elements of § 5.6.2.2.x.1 that are specifically included in the corresponding elements of § 5.6.2.2.x.2. Anything in § 5.6.2.2.x.1 that is not mentioned in § 5.6.2.2.x.2 is excluded.

5.6.2.2.1 Release 1

(This section is intentionally left blank.)

5.6.2.2.2 Release 1.5

5.6.2.2.2.1 IEEE Std 802.16: Standard for local and metropolitan area networks – Air interface for broadband wireless access systems

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 multiple PHY specifications, each suited to a particular operational environment.

5.6.2.2.2.1.1 IEEE Std 802.16-2009

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems

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 multiple PHY specifications, each suited to a particular operational environment.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2009 | Published | 2009-05-29 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.2.2.1.2 IEEE Std 802.16j-2009

Multihop Relay Specification

This amendment updates and expands IEEE Std 802.16-2009, specifying physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations. Subscriber station specifications are not changed.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16j-2009 | Published | 2009-06-12 | <http://standards.ieee.org/getieee802/802.16.html> |

5.6.2.2.2.1.3 IEEE Std 802.16-2012

Standard for Air Interface for Broadband Wireless Access Systems

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.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/80216Rev3.html> |

5.6.2.2.2.2 WiMAX Forum® Profile

The complete WiMAX Forum® Mobile System Profile, Release 1.5 is included in the following volumes.

5.6.2.2.2.2.1 WiMAX Forum® Mobile System Profile specification: Release 1.5 – Common part

This specification describes the features of the WiMAX Forum® Mobile System Profile, Release 1.5. It includes the features common to both the TDD and FDD operational modes. It has the following table of contents:

1 Scope

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

2 References

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

3 Definitions

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

4 PHY profile

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

5 MAC profile

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

6 Security

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-001-R015v03 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R015v03_MSP-Common-Part.pdf> |

5.6.2.2.2.2.2 WiMAX Forum® Mobile System Profile specification: Release 1.5 – FDD specific part

This specification describes the features of the WiMAX Forum® Mobile System Profile, Release 1.5. It includes the features specific to the FDD operational mode. The content refers to the physical and the MAC layers.

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-003-R015v01 | Published | 2009-08-01 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2009/07/WMF-T23-003-R015v01_MSP-FDD.pdf> |

5.6.2.2.2.2.3 WiMAX Forum® Mobile Radio Specification: Release 1.5

This specification describes the radio features of the WiMAX Forum® Mobile Radio Specification, Release 1.5.

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-005-R015v06 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-005-R015v06_RSP.pdf> |

5.6.2.2.3 Release 2

5.6.2.2.3.1 IEEE Std 802.16-2012

Standard for Air Interface for Broadband Wireless Access Systems

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.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/80216Rev3.html> |

5.6.2.2.3.1.1 IEEE Std 802.16p-2012

Standard for Air Interface for Broadband Wireless Access Systems — Amendment 1: Enhancements to Support Machine-to-Machine Applications

This amendment to IEEE Std 802.16-2012 specifies enhancements to provide improved support for machine-to-machine applications.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16p-2012 | Approved | 2012-08-30 | http://ieee802.org/16/pubs/80216p.html |

5.6.2.2.3.1.2 IEEE Std 802.16n-2013

Standard for Air Interface for Broadband Wireless Access Systems — Amendment 2: Higher Reliability Networks

This amendment to IEEE Std 802.16-2012, as previously amended by IEEE Std 802.16p-2012, specifies enhancements to support higher reliability networks.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16n-2013 | Approved | 2013-03-06 | http://ieee802.org/16/pubs/80216n.html |

5.6.2.2.3.2 IEEE Std 802.16.1-2012

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems

This standard specifies the WirelessMAN-Advanced air interface, including the medium access control layer (MAC) and physical layer (PHY), of a broadband wireless access (BWA) system supporting multiple services. The WirelessMAN-Advanced air interface supports ITU’s IMTAdvanced requirements.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1-2012 | Approved | 2012-06-08 | <http://ieee802.org/16/pubs/802161.html> |

5.6.2.2.3.2.1 IEEE Std 802.16.1b-2012

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems — Amendment 1: Enhancements to Support Machine-to-Machine Applications

This amendment to IEEE Std 802.16.1-2012 specifies enhancements to provide improved support for machine-to-machine applications.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1b-2012 | Approved | 2012-08-30 | http://ieee802.org/16/pubs/802161b.html |

5.6.2.2.3.2.2 IEEE Std 802.16.1a-2013

Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems — Amendment 2: Higher Reliability Networks

This amendment to IEEE Std 802.16.1-2012, as previously amended by IEEE Std 802.16.1b-2012, specifies enhancements to support higher reliability networks.

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| SDO | Document No. | Status | Issued date | Location |
| IEEE | IEEE Std 802.16.1a-2013 | Approved | 2013-03-06 | http://ieee802.org/16/pubs/802161a.html |

5.6.2.2.3.3 WiMAX Forum® Profile

5.6.2.2.3.3.1 WiMAX Forum® Mobile System Profile – Release 2.0

This provides the complete WiMAX Forum® Mobile System Profile – Release 2.0

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| SDO | Document No. | Status | Issued date | Location |
| WiMAX Forum | WMF-T23-001-R020v02 | Published | 2012-04-16 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/04/WMF-T23-001-R020v02_MSP.pdf> |

5.6.2.2.3.3.2 WiMAX Forum® Mobile Radio Specifications – Release 2.0

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| SDO | Document No. | Status | Issued date | Location |
| WiMAXForum | WMF-T23-005-R020v01 | Published | 2012-05-18 | <http://www.wimaxforum.org/sites/wimaxforum.org/files/technical_document/2012/05/WMF-T23-005-R020v01_RSP.pdf> |

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