



IEEE Standard for Conformance to IEEE 802.16

Part 4: Protocol Implementation Conformance Statement (PICS) Proforma for Frequencies below 11 GHz

**IEEE Computer Society
and the
IEEE Microwave Theory and Techniques Society**

Sponsored by the
LAN/MAN Standards Committee

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15 January 2007

IEEE Std 802.16™/Conformance04-2006
(Conformance to IEEE Std 802.16-2004)

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Abstract: This standard represents the Protocol Implementation Conformance Statement Proforma, per ISO/IEC 9646-7 and ITU-T X.296, for conformance specification of base stations and subscriber stations based on the air interface specified in IEEE Std 802.16 for frequencies below 11 GHz.

Keywords: broadband wireless access (BWA), compliance test, fixed broadband wireless access networks, metropolitan area network, microwaves, point-to-multipoint, wireless access systems (WAS), WirelessMAN® standards

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IEEE Standard for Conformance to IEEE 802.16

Part 4: Protocol Implementation Conformance Statement (PICS) Proforma for Frequencies below 11 GHz

1. Overview

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented for a telecommunications specification. Such a statement is called a protocol Implementation Conformance Statement (ICS).

1.1 Scope

This standard represents the Protocol Implementation Conformance Statement (PICS) Proforma, per ISO/IEC 9646-7¹ and ITU-T X.296, for conformance specification of base stations and subscriber stations based on the air interface specified in IEEE Std 802.16™-2004 for frequencies below 11 GHz.

1.2 Purpose

This document describes the capabilities and options within the air interface specified for frequencies below 11 GHz in IEEE Std 802.16-2004. It is to be completed by the supplier of a product claiming to implement the protocol. It indicates which capabilities and options have been implemented. It allows a user of the product to evaluate its conformance and to determine whether the product meets the user's requirements.

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies. The following documents contain provisions

¹Information on references can be found in Clause 2.

which, through reference in this text, constitute provisions of the present document. References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific. For a specific reference, subsequent revisions do not apply. For a non-specific reference, the latest version applies.

IEEE Std 802.16-2004, Local and Metropolitan Area Networks — Part 16: Air Interface for Fixed Broadband Wireless Access Systems.²

ISO/IEC 9646-1, Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts.³

ISO/IEC 9646-7, Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 7: Implementation Conformance Statements.

ETSI TS 102 385-1, Broadband Radio Access Networks (BRAN); HiperMAN/WiMAX; Conformance testing for the Data Link Control Layer (DLC); Part 1: Protocol Implementation Conformance Statement (PICS) proforma.⁴

3. Definitions and abbreviations

3.1 Definitions

This standard uses terms defined in IEEE Std 802.16-2004, ISO/IEC 9646-1, ISO/IEC 9646-7, and ETSI TS 102 385-1. *The Authoritative Dictionary of IEEE Standards Terms*, Seventh Edition, should be referenced for terms not defined in this clause.

In particular, the following terms and definitions defined in ISO/IEC 9464-1 apply:

Implementation Conformance Statement (ICS): Statement made by the supplier of an implementation or system claimed to conform to a given specification, stating which capabilities have been implemented. The ICS can take several forms: protocol ICS, profile ICS, profile specific ICS, information object ICS, etc.

ICS proforma: Document, in the form of a questionnaire, which when completed for an implementation or system becomes an ICS.

Protocol ICS (PICS): ICS for an implementation or system claimed to conform to a given protocol specification.

²IEEE publications are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>).

³ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembe, CH-1211, Genève 20, Switzerland/Suisse (<http://www.iso.ch/>). ISO/IEC publications are also available in the United States from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112, USA (<http://global.ihs.com/>). Electronic copies are available in the United States from the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>).

⁴ETSI publications are available from the European Telecommunications Standards Institute, 650 route des Lucioles, 06921 Sophia-Antipolis Cedex, France (<http://www.etsi.org>).

3.2 Abbreviations

This standard uses terms defined in IEEE Std 802.16-2004. In addition, the following abbreviations apply:

ATS	abstract test suite
ICS	Implementation Conformance Statement
IUT	Implementation Under Test
PICS	Protocol Implementation Conformance Statement
RCT	radio conformance test
SUT	System Under Test
TP	test purpose
TSS	test suite structure

4. Conformance to this PICS proforma specification

If it claims to conform to this standard, the actual PICS proforma to be filled in by a supplier shall be technically equivalent to the text of the PICS proforma given in Annex A and shall preserve the numbering, naming, and ordering of the proforma items.

A PICS that conforms to this standard shall be a conforming PICS proforma completed in accordance with the guidance for completion given in A.1.

Annex A

(normative)

PICS proforma for frequencies below 11 GHz

A.1 Guidance for completing PICS proforma⁵

A.1.1 Purposes and structure

The purpose of this PICS proforma is to provide a mechanism whereby a supplier of an implementation of the requirements for WirelessMAN below 11 GHz defined in IEEE Std 802.16-2004 may provide information about the implementation in a standardized manner.

The PICS proforma is subdivided into subclauses for the following categories of information:

- Guidance for completing the PICS proforma
- Identification of the implementation
- Identification of the standard
- Global statement of conformance
- Roles
- WirelessMAN-OFDM
- WirelessMAN-OFDMA

A.1.2 Abbreviations and conventions

Item column

The Item column contains a number that identifies the item in the table.

Capability column

The capability column describes in free text each respective item (e.g., parameters and timers). It implicitly means “Is <capability> supported by the implementation?”.

Reference column

The reference column indicates the section(s) of IEEE Std 802.16-2004 from which the requirement for the capability is derived.

⁵Copyright release for PICS proformas: Users of the published standard may freely reproduce the PICS proforma in this annex so that it can be used for its intended purpose, and they may further publish the completed PICS.

Status column

The following notations, defined in ISO/IEC 9646-7, are used in the status column:

m	Mandatory — the capability is required to be supported
o	Optional — the capability may be supported or not
n/a	Not applicable — in the given context, it is impossible to use the capability
x	Prohibited (excluded) — there is a requirement not to use this capability in the given context
o.i	Qualified option — for mutually exclusive or selectable options from a set. “i” is an integer that identifies a group of related optional items and the logic of their selection which is defined immediately following the table
ci	Conditional — the requirement on the capability (“m”, “o”, “x”, or “n/a”) depends on the support of other optional or conditional items. “i” is an integer identifying a conditional status expression that is defined immediately following the table.
i	Irrelevant (out of scope) — capability outside the scope of the reference specification. No answer is requested from the supplier.

Support column

The support column shall be filled in by the supplier of the implementation. The following common notations, defined in ISO/IEC 9646-7, are used for the support column:

Y or y	Supported by implementation.
N or n	Not supported by implementation.
N/A, n/a or -	No answer required (allowed only if the status is n/a either directly or after the evaluation of a conditional status).

Values column

The values column is only used when necessary in a table. It contains the type, the list, the range, or the length of values. The following notations are used:

Range of values: Example:	<min value>..<>max value> 5..20
List of values: Example 1: Example 2: Example 3:	<value1>, <value2>, ..., <valueN> 2, 4, 6, 8, 9 1101b, 1011b, 1111b 0x0A, 0x34, 0x2F
List of named values: Example:	<name1>(<val1>), <name2>(<val2>), ..., <nameN>(<valN>) reject(1), accept(2)
Length: Example:	Size (<min size>..<>max size>) Size (1..8)

Values supported column

The values supported column is only present when the values column is present. It shall be filled in by the supplier of the implementation. In this column, the value or the ranges of values supported by the implementation shall be indicated.

Reference to items

For each possible item answer in the support column within the PICS proforma a unique reference exists that may be used, for example, in conditional expressions. It is defined as the table identifier, followed by the “/” character, followed by the item number in the table. If there is more than one support column in a table, the columns are discriminated by letters (a, b, etc.).

Example:	A.5/4 is the reference to the answer of item 4 in Table A.5.
Example:	A.6/3b is the reference to the second answer (i.e., in the second support column) of item 3 in Table A.6.

Prerequisite line

A prerequisite line takes the following form:

Prerequisite: <predicate>

A prerequisite line after a clause or table title indicates that the entire clause or the entire table is not required to be completed if the predicate is FALSE.

A.1.3 Instructions for completing the PICS proforma

The supplier of the implementation shall complete the PICS proforma in each of the spaces provided. In particular, an explicit answer shall be entered, in the support or values supported column boxes provided, using the notation described in A.1.2.

However, tables specific for subscriber stations (SS) shall only be completed for SS implementations, and tables specific to base stations (BS) shall only be completed for BS implementations.

If necessary, the supplier may provide additional comments in the space at the bottom of the tables or separately.

A.2 Identification of the implementation

Identification of the Implementation Under Test (IUT) and the system in which it resides [the System Under Test (SUT)] should be filled in to provide as much detail as possible regarding version numbers and configuration options.

The product supplier and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the PICS should be named as the contact person.

A.2.1 Date of statement

Date of Statement:

A.2.2 Implementation Under Test (IUT) identification

IUT name:

IUT version:

A.2.3 System Under Test (SUT) identification

SUT name:

Hardware configuration:

Operating system:

A.2.4 Product supplier

Name:

Address:

Telephone number:

Facsimile number:

E-mail address:

Additional information:

A.2.5 Client (if different from product supplier)

Name:
Address:
Telephone number:
Facsimile number:
E-mail address:
Additional information:

A.2.6 PICS contact person

(A person to contact if there are any queries concerning the content of the PICS.)

Name:
Telephone number:
Facsimile number:
E-mail address:
Additional information:

A.3 Identification of the standard

This PICS proforma applies to IEEE Std 802.16-2004.

A.4 Global statement of conformance

Are all mandatory capabilities implemented? (Yes/No)

NOTE—Answering “No” to this question indicates non-conformance to IEEE Std 802.16-2004. Non-supported mandatory capabilities are to be identified in the PICS, with an explanation of why the implementation is non-conforming, on pages attached to the PICS proforma.

A.5 Protocol ICS for MAC layer of WirelessMAN OFDMA**Table A.1—Profiles**

Profiles	Reference	Status	Support
OFDMA_ProfP1	12.4.3.2	o.1	
OFDMA_ProfP2	12.4.3.3	o.1	
OFDMA_ProfP3	12.4.3.4	o.1	
OFDMA_ProfP4	12.4.3.5	o.1	
OFDMA_ProfP5	12.4.3.6	o.1	
OFDMA_ProfP6	12.4.3.7	o.1	
OFDMA_ProfP7	12.4.3.8	o.1	
OFDMA_ProfP8	12.4.3.9	o.1	
OFDMA_ProfP9	12.4.3.10	o.1	

o.1: It is mandatory to support at least one of these items.

A.5.1 Roles**Table A.2—Roles**

Item	Role	Reference	Status	Support
1	Subscriber station (SS)		o.2	
2	Base station (BS)		o.2	

o.2: It is mandatory to support at least one of these items.

A.5.2 PICS for SS—subscriber station

This subclause contains the PICS proforma tables related to the SS. They need to be completed for the description of SS implementations only.

Prerequisite: A.2/1 --subscriber station. This prerequisite applies throughout this subclause A.5.2.

A.5.2.1 Network topology

Table A.3—Network topology

Item	Role	Reference	Status	Support
1	PMP topology (SS to BS traffic)		m	

A.5.2.2 SS capabilities of the physical layer in PMP topology

Prerequisite: A.3/1 --PMP topology.

This prerequisite applies throughout this subclause A.5.2.2.

Table A.4—Channelization for SS in PMP topology

Item	Name	Reference	Status	Support
1	1.25 MHz channel PHY	12.4	o.4	
2	3.5 MHz channel PHY	12.4	o.4	
3	7.0 MHz channel PHY	: 12.4	o.4	
4	8.75 MHz channel PHY	12.4	o.4	
5	14 MHz channel PHY	12.4	o.4	
6	17.5 MHz channel PHY	12.4	o.4	
7	28 MHz channel PHY	12.4	o.4	
8	10 MHz channel PHY	12.4	o.4	
9	20 MHz channel PHY	12.4	o.4	

o.4: It is mandatory to support at least one of these items.

Table A.5—Power classes for SS in PMP topology

Item	Name	Reference	Status	Support
1	$P_{TX,max} < 17$ dBm	12.4.1	o.5	
2	17 dBm $< P_{TX,max} < 20$ dBm	12.4.1	o.5	
3	20 dBm $< P_{TX,max} < 23$ dBm	12.4.1	o.5	
4	23 dBm $< P_{TX,max} < 30$ dBm	12.4.1	o.5	
5	$P_{TX,max} > 30$ dBm	12.4.1	o.5	

o.5: It is mandatory to support at least one of these items.

Table A.6—Duplexing modes—PMP

Item	Name	Reference	Status	Support
1	TDD Time Division Duplexing	6.3.7.2	o.6	
2	Framed FDD Frequency Division Duplexing Full duplex	6.3.7.1	o.6	
3	Framed FDD Half Duplex	6.3.7.1	o.6	

o.6: It is mandatory to support at least one of these items.

Table A.7 lists the optional functions that have a direct impact on the protocol or on the associated profiles.

Table A.7—Major PHY functions for SS in PMP

Item	Name	Reference	Status	Support
1	AAS (Adaptive Antenna) Diversity MAP Scan	8.4.4.6	o	
2	AAS (Adaptive Antenna) Direct Signaling	8.4.4.7	o	
3	Optional FUSC	8.4.6.1.2.3	o	
4	Optional PUSC	8.4.6.2.5	o	
5	AMC	8.4.4.7.8	o	
6	H-ARQ	8.4.9.2.3.1	o	
7	Dynamic Frequency Support DFS	6.3.15	o	
8	Encoding	8.4.9.2	o	

A.5.2.3 SS capabilities of the MAC in PMP topology

Prerequisite: A.3/1 --PMP topology

This prerequisite applies throughout this subclause A.5.2.3.

A.5.2.3.1 SS convergence sublayer—SS in PMP

Table A.8—Convergence sublayer protocol support

Item	Name	Reference	Status	Support
1	Packet convergence sublayer	5.2	m	
2	ATM convergence sublayer	5.2	o	

Table A.9—Packet convergence sublayer protocol support

Item	Name	Reference	Status	Support
1	Internet Protocol (IPv4)	5.2	m	
2	Internet Protocol (IPv6)	5.2	o	
3	IEEE 802.3™ (Ethernet)	5.2	m	
4	IEEE 802.1Q™ VLAN	5.2	o	

Table A.10—ATM convergence sublayer protocol support

Prerequisite: A.8/2: SS supports ATM

Item	Name	Reference	Status	Support
1	ATM in VP switched mode	5.1	o.10	
2	ATM in VC switched mode	5.1	o.10	

o.10: It is mandatory to support at least one of these items.

Table A.11—CS functions in SS

Item	Name	Reference	Status	Support
1	Packet header suppression (PHS)	5.2.4	o	
2	Packet classification	5.2	o	

Table A.12—Major sending CS functions (SS in PMP)

Item	Name	Reference	Status	Support
1	Classification of PDUs into appropriate connection	5.2	m	
2	Suppression of payload header information (PHS function)	5.1.2.3 5.2.4	c12-01	
3	Delivery of resulting CS PDU to the MAC SAP associated with the service flow	5.2	m	

c12-01: IF A.11/1- if SS supports PHS protocol
 THEN m - then mandatory
 ELSE n/a - else not applicable

Table A.13—Major receiving CS functions (SS in PMP)

Item	Name	Reference	Status	Support
1	Receipt of the CS PDU	5.2	m	
2	Rebuilding of suppressed payload header information (PHS function)	5.1.2.3 5.2.4	c13-01	

c13-01: IF A.11/1- if SS supports PHS protocol
 THEN m - then mandatory
 ELSE n/a - else not applicable

Table A.14—Major packet payload header suppression capabilities

Item	Name	Reference	Status	Support
1	PHSV: test validity of Header (before suppression)	5.2.4	c14-01	
2	PHSM: mask to allow selective suppression of header	5.2.4	c14-01	

c14-01: IF A.11/1- if SS supports PHS protocol
 THEN m - then mandatory
 ELSE n/a - else not applicable

Table A.15—Major packet classification

Item	Name	Reference	Status	Support
1	IP Classification of PDUs into appropriate connection	11.13.19.3.4	m	
2	Ethernet classification of PDUs into appropriate connection	11.13.19.3.4	c15-01	
3	IEEE 802.1Q VLAN classification of PDUs into appropriate connection	11.13.19.3.4	c15-02	

c15-01: IF A.9/4 - if SS supports Ethernet protocol
 THEN m - then mandatory
 ELSE n/a - else not applicable

c15-02: IF A.9/5 - if SS supports 802.1Q protocol
 THEN m - then mandatory
 ELSE n/a - else not applicable

Table A.16—Ethernet packet classification in the UL

Prerequisite: A.9/4 --Ethernet support

Item	Name	Reference	Status	Support
1	Classification based on Destination MAC Address	11.13.19.3.4.8	m	
2	Classification based on Source MAC Address	11.13.19.3.4.9	m	
3	Classification based on Ethertype/SAP	11.13.19.3.4.10	m	

Table A.17—802.1Q packet classification in the UL

Prerequisite: A.9/5 --802.1Q support

Item	Name	Reference	Status	Support
1	Classification based on 802.1D user priority	11.13.19.3.4.11	m	
2	Classification based on 802.1Q VLAN ID	11.13.19.3.4.12	m	

A.5.2.3.2 SS MAC common part sublayer—PMP**Table A.18—Major MAC common part functionalities for SS in PMP**

Item	Name	Reference	Status	Support
1	Addressing and connections	6.3.1	m	
2	Construction of PDUs	6.3.3	m	
3	ARQ	6.3.4	o	
4	Uplink scheduling service	6.3.5	m	
5	Bandwidth allocation and request	6.3.6	m	
6	Duplexing modes	6.3.7	m	
7	Contention resolution	6.3.8	m	
8	Network entry and initialization	6.3.9	m	
9	OFDMA-based ranging	6.3.10.3	m	
10	Update of UL and DL channel descriptors	6.3.11	m	
11	Quality of service	6.3.13	m	
12	Managed mode	[1] 6.3.9	o	

Table A.19—Miscellaneous management functions for SS in PMP

Item	Name	Reference	Status	Support
1	Assignment of SSs to multicast groups (MCA_REQ messages from BS)	6.3.12	m	
2	SS reset initiated by BS (RES-CMD)	6.3.2.3.22	m	
3	SS network clock comparison initiated by BS (CLK-CMP)	6.3.2.3.25	m	
4	SS notifies BS of de-registration (DREG-REQ)	6.3.2.3.43	m	
5	SS forced by BS to change its channel access (DREG-CMD)	6.3.2.3.26	m	
6	SS receives quick answer from BS to its DSx-REQ (DSX-RVD)	6.3.2.3.27	m	
7	SS informs BS of reception of Config file (TFTP messages)	6.3.2.3.28 6.3.2.3.29	c19-01	
8	SS answers to BS channel management report request (REP-REQ and REP-RSP)	6.3.2.3.33	m	
9	SS applies the power change requested by the BS (FPC)	6.3.2.3.34	m	
10	SS answers the AAS feedback message request from the BS (AAS-FBCK messages)	6.3.2.3.40	c19-02	
11	SS informs the BS of preferred beam direction (AAS-BEAM select message)	6.3.2.3.41	c19-02	
12	SS answers the AAS beam message request from the BS (AAS-Beam messages)	6.3.2.3.42	c19-02	

c19-01 IF A.18/12 -if SS supports Managed Mode

THEN m - then mandatory

ELSE n/a - else not applicable

c19-02 IF A.7/1 - if SS supports AAS mode (adaptive antenna)

THEN m - then mandatory

ELSE n/a - else not applicable

A.5.2.3.2.1 Addressing and connections**Table A.20—Addressing and connections—PMP**

Item	Capability	Reference	Status	Support
1	Globally Unique SS MAC Address	6.3.1	m	
2	Time urgent MAC Management messages on basic connection	6.3.1	m	
3	Delay tolerant MAC Management messages on primary management connection	6.3.1	m	
4	IP packets on the secondary management connection	6.3.1	c20-01	

c20-01 IF A.18/12 -if SS supports Managed Mode
 THEN m - then mandatory
 ELSE n/a - else not applicable

A.5.2.3.2.2 Construction and transmission of MAC PDUs**A.5.2.3.2.2.1 Conventions****Table A.21—Transmission conventions**

Item	Capability	Reference	Status	Support
1	Transmit messages most significant byte first	6.3.3.1	m	
2	Transmit bytes most significant bit first	6.3.3.1	m	

A.5.2.3.2.2.2 PDU concatenation**Table A.22—PDU concatenation**

Item	Capability	Reference	Status	Support
1	Concatenate Multiple MAC PDUs into a single burst of the allocated length	6.3.3.2	m	
2	Receive concatenated MAC PDUs and determine disposition via CID	6.3.3.2	m	