Product Specification:
Airspan WiMAX MiMAX-Pro V-Series
System Release 9.0

This specification details performance parameters and features supported by the specific product and Airspan system release as stated. It covers the standard configuration of MiMAX-Pro.

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Revision History

Revision	Originator	Date	Description
0.1	Alex Tipograff	2008/8/5	Initial draft
0.2	Alex Tipograff	2008/8/11	Minor changes
0.3	Alex Tipograff	2008/8/19	document reference number added
0.4	Alex Tipograff	2008/9/17	MTBF values added
0.5	Alex Tipograff	2008/9/18	Dimensions and weight updated
0.6	Alex Tipograff	2008/11/14	N type connector for ext. ant. removed
A	Alex Tipograff	2009/3/11	Minor changes ,doc. Status change
A1	Alex Tipograff	2009/3/14	Minor changes
A2	Alex Tipograff	2009/10/12	Classifier number added + TX power figures corrected
A3	Alex Tipograff	2009/11/20	Minor changes
A4	Felix Eshed	2010/4/20	Minor changes and updates
A5	Felix Eshed	2010/5/10	Minor changes

Contents

1   Product Overview

MiMAX-Pro is outdoor WiMAX customer premises equipment (CPE). The MiMAX-Pro, which is used Sequans broadband interface, connects IP-enabled devices directly to WiMAX networks. Designed for the residential and small enterprise markets, the device supports high-speed broadband Internet through a Fast Ethernet connection. The MiMAX-Pro ensures high service availability at enhanced ranges, operating in both LOS and NLOS propagation environments.

MiMAX-Pro is normally deployed with a built-in, integral antennas. Requiring professional installation, the MiMAX-Pro is installed outdoors on a pole or wall, enabling optimal positioning for best reception with the BS.

Designed for the residential, SOHO, and small to medium enterprise (SME) markets, the device delivers over-the-air, high-speed broadband Internet from the Airspan WiMAX base stations to the end-user. The MiMAX-Pro ensures high service availability at enhanced ranges, operating in both LOS and NLOS propagation environments.

MiMAX-Pro is available in the following RF bands[1]:

- 2.3-2.4 GHz in TDD mode

- 2.5-2.69 GHz in TDD mode

- 3.3 – 3.6 GHz in TDD mode

- 3.6 – 3.8 GHz in TDD mode

MiMAX-Pro uses the OFDM signaling format, providing non line-of-sight (NLOS) performance. MiMAX-Pro utilizes 64 QAM, 16 QAM and QPSK, modulation technologies by modulating transmitted signals and demodulating the received signals where the original digital message can be recovered. The use of adaptive modulation allows MiMAX-Pro to optimize throughput, yielding higher throughputs while also covering long distances.

1.1   Main Features

- IEEE 802.16e-2005 Wave 2 compliance
- OFDMA modulation, 512, 1024 FFT points QPSK, 16QAM, 64QAM
- Output power: 38 dBm (EIRP)
- Antenna - Integrated Directional Dual Polarization
- Security
    - 802.16e PKMv2 key management
    - X.509 digital certification for device authentication
    - EAP-TLS & EAP-TTLS (MD5, MSCHAPv2) device and user authentication methods
    - AES encryption
- TR-069 & OMA-DM for remote management
    - WEB-based interface for local management
- MIMO Matrix A and B on DL
- DL MRC

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[1] Supported channel bandwidths detailed in 2.3

1.2 Block Diagram

MiMAX-Pro block diagram is shown below:
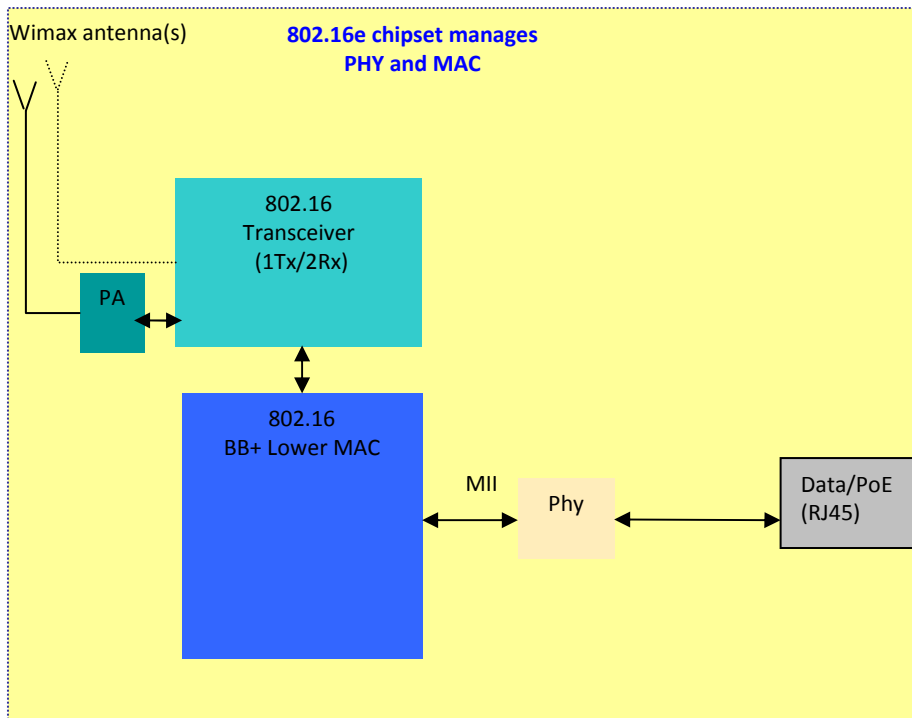
1.3 MiMAX Pro V-Series product view

MiMAX-Pro picture is shown below:

2 Air Interface

2.1 Frequency of Operation & Duplex Methods

Frequency	Frequency Range
2.3 GHz	2300 to 2400 MHz
2.5 GHz	2496 to 2690 MHz
3.5 GHz	3300 to 3600 MHz
3.7 GHz	3600 to 3800MHz

2.2 Multiple Access Scheme
Scalable OFDMA, as defined by IEEE802.16-2005

2.3 Channel Bandwidths
5 & 10Mhz for 2.3 GHz and 2.5 GHz, 3.5, 5 ,7 & 10Mhz for 3.5 and 3.7GHz.

2.4 Modulation & FEC
The following modulation and FEC combinations are supported as indicated:

Modulation	FEC
64QAM	$5/6$
64QAM	$3/4$
64QAM	$2/3$
64QAM	$1/2$
16QAM	$3/4$
16QAM	$1/2$
QPSK	$3/4$
QPSK	$1/2$

2.5 Frame Duration
5ms

2.6 Cyclic Prefix
1/8

2.7 Scheduling
MiMAX Pro Supports UGS, RT-VR, NRT-VR,ERT-VR and BE as defined by IEEE802.16-2005

2.8 Authentication & Security
MiMAX Easy supports following aspects of authentication and security:

- 802.16e PKMv2 key management
- X.509 digital certification for device authentication
- EAP-TLS , EAP-TTLS (MD5, MSCHAPv2) device and user authentication methods
- AES encryption

2.9 MIMO support
- Matrix A + MRC in DL for two antennas
- Matrix B on DL

3   Equipment Capacity

3.1   RF Channel Throughput

RF Channel capacity is as per the IEEE802.16-2005 specification.

MiMAX -Pro is half duplex.

4 Radio Performance & Features

4.1 Standards Compliance

MiMAX-Pro is compliant with IEEE 802.16-2005 Wave2 Standard

4.2 Link Budget

The following RF Parameters contribute to the overall system link budget

4.2.1 Maximum Transmit Level (dBm)

The following table details the Transmit (Tx) Power levels of MiMAX-Pro at the various modulations*

Modulation	FEC	2.3~2.4 GHz	2.5 & 2.7 GHz	3.3~3.6 GHz	3.6~3.8 GHz
Model	CTC	MiMAX-Pro	MiMAX-Pro	MiMAX-Pro	MiMAX-Pro
16QAM	3/4	27	27	27	27
16QAM	1/2	27	27	27	27
QPSK	1/2	27	27	27	27

*Note: The output power is measured (1) at antenna port; and (2) under normal room temperature @25C

4.2.2 Receiver Sensitivity

The following table details the receiver sensitivity for each modulation/FEC combination as measured at the transceiver RF port.

- 10Mhz, Typical levels for BER $\leq 1 \times 10^{-6}$ (dBm) MIMO[2] and MRC ON

Modulation	FEC	2.3~2.4 GHz	2.5 & 2.7 GHz	3.3~3.6Ghz	3.6~3.8Ghz
Model	CTC	MiMAX-Pro	MiMAX-Pro	MiMAX-Pro	MiMAX-Pro
64QAM	5/6	-85	-86	-87	-85
64QAM	3/4	-86	-86	-87	-87
64QAM	2/3	-90	-91	-92	-90
64QAM	1/2	-91	-91	-92	-91
16QAM	3/4	-92	-92	-93	-92
16QAM	1/2	-96	-96	-97	-96
QPSK	3/4	-98	-99	-100	-98
QPSK	1/2	-100	-100	-100	-100

- 5Mhz, Typical levels for BER $\leq 1 \times 10^{-6}$ (dBm) MIMO[3] and MRC ON

Modulation	FEC	2.3~2.4 GHz	2.5 & 2.7 GHz	3.3~3.6Ghz	3.6~3.8Ghz
Model		MiMAX-Pro	MiMAX-Pro	MiMAX-Pro	MiMAX-Pro
64QAM	5/6	-86	-87	-87	-86
64QAM	3/4	-87	-88	-87	-86
64QAM	2/3	-91	-92	-92	-91
64QAM	1/2	-92	-92	-92	-92
16QAM	3/4	-93	-93	-93	-93
16QAM	1/2	-97	-97	-97	-96
QPSK	3/4	-99	-99	-100	-98
QPSK	1/2	-101	-101	-101	-100

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[2] Matrix A
[3] Matrix A

*Note: (1) Sensitivity levels measured while MiMAX-Pro operating in fixed modulation scheme as described in MRCT.

4.3   Dynamic Range

MiMAX-Pro Transmit Power Control Range is 60 dB

5   Software Features

5.1   Standards Compliance

MiMAX-Pro is compliant to the following standards:

- IEEE 802.16e-2005 (802.16e)

5.2   Convergence layer support

MiMAX-Pro operates as NAT/NAPT or IP forwarder on IPCS.

5.2.1   Convergence Sub-layer

- The MiMAX-Pro provides hardware support to perform classification based on Ethernet and IP convergence sub layers, as well as PHS and ROHC header compression.

Radio interface packets can be classified according to classifiers based on Ethernet and IP convergence sublayer formats.

Packet Convergence Sublayer support
A.   Internet Protocol (IPv4)
B.   Internet Protocol (IPv6)
C.   IEEE 802.3 (Ethernet)
D.   802.1Q
E.   Packet, IPv4 over 802.3/Ethernet
F.   Packet, IPv6 over 802.3/Ethernet
G.   IPv4 with Header Compression (ROHC)
H.   IPv6 with Header compression (ROHC)

IP Packet Classification in the UL
- Classification based on DSCP /IP TOS field
- Classification based on IP Protocol/Next Header field
- Classification based on IP masked Source Address
- Classification based on IP Destination Address
- Classification based on protocol source port range
- Classification based on protocol destination port range
- Classification based on 802.1Q

- Data Forwarding

  - IP: basic IP switching support for IPv4. TCP and UDP checksums are verified when present.
  - Raw: No specific action is undertaken, just simple forwarding of all packets.

5.3   Service Flow Scheduling & QoS

5.3.1   Service Flows

MiMAX-Pro is designed to support up to 18 Service Flows (1 Primary, 1 Basic and 16 data).
MiMAX-Pro is designed to support up to 8 classifiers per SF
MiMAX-Pro is designed to support up to 64 classifiers on UL

Note: The numbers above are predefined in order to prevent memory fragmentation and can be modified according to the specific customer's request with congestion of the memory size allocation.

5.3.2 QoS

MiMAX-Pro supports following scheduling services
- Best Effort (BE)
- Unsolicited Grant service (UGS)
- Real-Time Polling Service (RTPS)
- Non-Real-Time Polling Service (NRTPS)
- Extended Real-Time Polling Service (ERTPS)

5.4 Authentication & Security

Following features are supported
- PKMv2 CMAC, security association
- EAP-TLS, EAP-TTLS(MD5, MS-CHAPv2) authentication
- X.509 certificate
- Cryptographic Suites
  - No data encryption, no data authentication
  - CCM-Mode 128-bit AES, CCM Mode, AES Key Wrap with 128-bit key

5.5 Networking

5.5.1 NAPT (Network Address Port Translation)/ NAT (Network Address Translation)

NAPT extends the capabilities of Basic NAT by translating the port field in outgoing packet headers in addition to the source address field. It allows the MiMAX-Pro to handle multiple simultaneous connections from multiple hosts on the private network to the same server on the public side.

5.5.2 DHCP

DHCP (Dynamic Host Configuration Protocol) server and client support

5.6 Local & Remote Management

MiMAX-Pro is designed for local and remote management via TR-069, OMA-DM or web server:

- Provisioning & Configuration: auto configuration and dynamic service activation
  - Initial CPE configuration
  - Remote CPE configuration - configuration of the device (including first time use), enabling and disabling features; Allowing changes to settings and parameters of the device
- Firmware upgrade & management
  - Version management
  - Update management
- Fault Management: Status and performance control
  - Logfile analysis and dynamic messages
  - Diagnostics
  - Connectivity and service control.
  - Device error report, devise status query

5.6.1 TR-069

TR-069 (Technical Report 069) is a DSL Forum technical specification entitled *CPE WAN Management Protocol* (CWMP). It defines an application layer protocol for remote management of end-user devices.

5.6.2 OMA-DM

OMA Device Management is a device management protocol specified by the Open Mobile Alliance (OMA) Device Management (DM) Working Group and the Data Synchronization (DS) Working Group.

6 Physical & Powering

6.1 Dimensions

Parameter	Value
Dimensions (height x width x depth)	205 X 205 X 55 mm
Weight	1.2Kg

6.2 MiMAX-Pro Port Description

Panel	Interface
Back	One 10/100BaseT Ethernet LAN & PoE

6.3 Power Supply

6.3.1 Supply Voltage
48V PoE (Power Over Ethernet)

6.3.2 Power Consumption

Mode	Power Consumption
Peak	12.9 W

7 Environmental, Regulatory and Certification

7.1 Environmental

Operating Temperature	-40°to +70℃
Humidity	95% @ 40℃ (non condensing)

7.2 Regulatory

The MiMAX-Pro V-Series are compliant with the following standards:

EMI	● FCC 47CFR Part 27 Subpart M(2.5~2.69Ghz) ● EN302 326-1/-2/-3
EMC	● FCC 47CFR Part 15 Subpart B ● EN301 489 ● EN55022, Class B (Emissions) ● EN50082-1 (Immunity) ● EN61000-3-2 (Harmonic AC current emissions)
Safety:	● UL1950 /CSA C22.2.950 ● EN60 950 (IEC 950)

Note: The compliance is subject to the local regulatory

8   Accessories

8.1   Antenna

- Integrated Directional Dual Polarization antenna
- Typical antenna gain:
  - 14 dBi @ 2.3 and 2.5 GHz
  - 15 dBi @ 3.3-3.6 GHz
  - 15 dBi @ 3.6-3.8 GHz

8.2   PoE Adapter
- Dimensions: 68x50x25mm
- Input voltage 100 VAC – 240 VAC 50 Hz to 60 Hz
- Operating Temperature: -5℃ to 50℃
- One RJ-45 Data cable out for PC& One RJ-45 female connector Data Out and 48V Power Out

8.3   Mounting Kit

- Pole/Wall mounting with vertical and horizontal tilting options
- Waterproof sealing cap for RJ 45 POE connector
- Bracket screws and washers

8.4   RSSI strength indicator

- MiMAX Pro V-Series equipped with buzzer indication the signal strength and link status.

9   MTBF

Product	MTBF (Years)	MTBF (Hours)
MiMAX PRO V- Series	28	243,860

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE:
Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance **23** cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

Due to the essential high output power natural of WiMAX device, use of this device with other transmitter at the same time may exceed the FCC RF exposure limit and such usage must be prohibited (unless such co-transmission has been approved by FCC in the future).