

Evolution™ WiMAX 3.5 GHz Mini-PCI Reference Kit IEEE 802.16-2004 OFDM

Product Description

The Evolution™ 3.5 GHz Mini-PCI Reference Kit is a tool kit intended to serve as a development platform to guide and support efforts in designing 3.5 GHz WiMAX compliant wireless systems using the DM256 integrated circuit. The device implements the IEEE 802.16-2004 WirelessMAN-OFDM™ PHY and IEEE 802.16-2004 WirelessHUMAN-OFDM™ as well as the ETSI HIPERMAN™ PHY layer protocols.

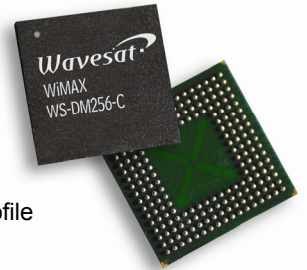
This Reference Kit contains a base station emulator platform and an extended length Mini-PCI module based subscriber station which provides a complete plug-and-play solution for the lower layer air interface and time critical low-level MAC functionality. This Reference Kit facilitates the system design by reducing development efforts.

Features

- Command line interface via Console port
- Supports Quality of Service (QoS)
 - Non real time polling service (nrtPS)
 - Best effort (BE)
- Privacy and data encryption support
- IEEE 802.3 convergence sublayer support
- Downlink/Uplink remote management
- Real-Time Linux based OS
- Embedded WiMAX testing functions
- IEEE 802.16-2004 MAC object code (Subscriber Station)

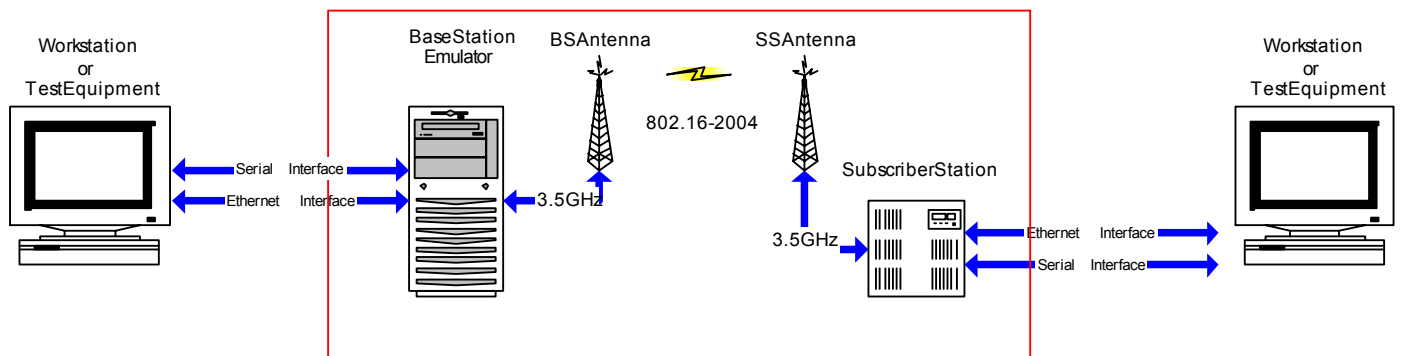
Highlights

- XScale Processor IXP425
- Fully supports Wave 2 WiMAX certification profile
 - profM3_PMP MAC system profile
 - 3.5 GHz RF interface
 - 3.5 MHz & 7 MHz bandwidths
 - TDD and HFDD duplexing modes
 - profC3_20 transmit power class profile
- Meets WiMAX spectral mask and EVM requirements
- 37.5 Mbps data throughput¹
- Adaptive modulation
 - BPSK, QPSK, 16-QAM, 64-QAM
- Patented channel equalization / synchronization algorithms
- Schematics, Gerbers and BOM for subscriber station cards
- Basic base station emulation on PC



Benefits

- Evaluate performance under various conditions
 - BER vs SNR
 - Spectral mask compliance test
- Complete access to the DM256 & MC236-PCI registers via software
- Forward compatibility with IEEE 802.16e PHY for mobile applications
- Working Reference System to help fine-tune your prototype
- Built on existing proven software
- License to reuse all software and schematics
- Saves months on design cycle
- Subscriber station MAC object code supports variety of processors and RTOS²
- Fast proof of concept capability



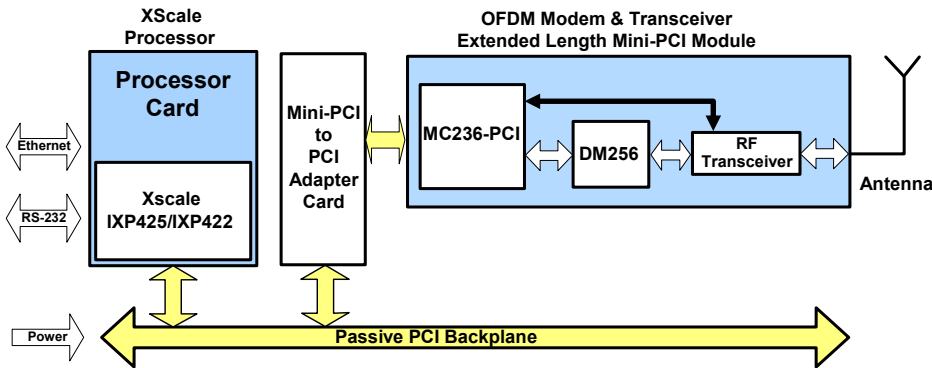
¹Raw data in BER test mode

²Contact Wavesat for list of tested combinations

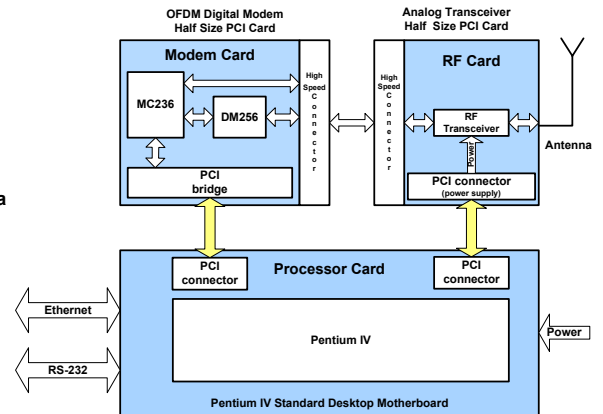
Evolution™ WiMAX 3.5GHz Reference Kit

The kit includes two units: one based on a Half Size PCI card chassis (**subscriber platform**) to implement subscriber functionality including a radio transceiver, and other unit based on PC architecture (**base emulator**) to emulate base station functionality thus providing an environment allowing demonstrations and proof of concept of a WiMAX wireless system. Optionally, additional subscriber platform units can be configured to allow for a Point-to-Multipoint environment. The Reference Kit includes subscriber MAC object code, drivers, technical documentation, schematics, Gerbers, BOM and 3-months of technical support. This Reference Kit will significantly reduce development effort for designers of WiMAX compliant broadband wireless systems.

Subscriber Platform



Base Emulator



Processor Card – XScale Processor PCI Card

The Processor Card is responsible for the control and communication of the modules connected to it through its PCI interface. This card is the main controller of the subscriber station, it supports and it executes the subscriber's main software.

- Processor:
 - Intel XScale IXP425 @ 533MHz.
- Memory:
 - 16 to 128 MBytes SDRAM (default 32 Mbytes).
 - 16Mbytes FLASH Memory.
- Communications:
 - Two serial ports.
 - One Ethernet 10/100 Mbps.
 - PCI bus interface.
 - JTAG Interface.
 - One I2C Serial EEPROM.



Processor Card
XScale Processor PCI Card.

Software Features

The Reference Kit includes the object code for a complete instance of a WiMAX compliant subscriber station MAC. The corresponding source code, developed by Wavesat engineers representing thousands of lines of "C" code, which can be purchased separately. The access to the full source code provides the unique capability to implement a WiMAX system reducing dramatically your time to market.

- Real Time Linux based OS.
- Device drivers for the Mini-PCI module (containing MC236-PCI, DM256 and transceiver components).
- Static scheduler (script based).
- Big endian and little endian modes supported for base emulator and low level drivers.
- Encryption / Decryption support.
- IEEE 802.3 convergence sub layer (Ethernet).

Subscriber MAC Features

- Fully support WiMAX mandatory requirements for profM3_PMP profile
- Full protocol stack
- Concatenation / Fragmentation packets
- Support nrtPS and best effort scheduling (QoS)
- Object code with technical support

Base Emulator Features

- Scripted IEEE 802.16 based test platform
- WiMAX test scripts embedded on software
- Emulator base station message passing.
- Support multiple transport connections for traffic demonstration
- PC based platform

OFDM Modem Mini-PCI Module

The Mini-PCI reference design integrates Wavesat's DM256 and MC236-PCI on an extended length Mini-PCI module (dimensions 59.75 mm × 80.0 mm). A standard Mini-PCI to PCI adapter card (included in Reference Kit) allows one to plug the module into the PCI based Reference Kit chassis. The motherboard processor has bidirectional access to the modem card through the Mini-PCI Interface. For data transmission the DM256 encodes and modulates the digital data from the MAC into an OFDM analog signal which is sent to the RF circuitry. For data reception, the DM256 receives the OFDM analog signal from the RF chipset and demodulates and encodes it into digital data for the MAC. The Mini-PCI module contains RF circuitry performing the up/down conversion to/from the 3.5 GHz bands. It supports TDD duplexing mode as well as HFDD.

Evolution™ WiMAX DM256 ASIC

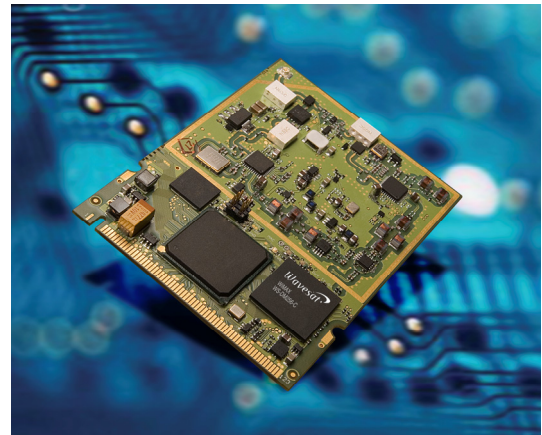
The DM256 is a low cost integrated circuit with low power consumption that implements the IEEE 802.16-2004 OFDM™ PHY layer protocol. It is designed to be the main component of an OFDM modem for Broadband Wireless Access (BWA).

MC236-PCI MAC Coprocessor

The MC236-PCI is a low-level hardware MAC coprocessor for the IEEE P802.16-2004 Wireless MAN-OFDM™ MAC layer protocol and is intended to be a companion device to the DM256 PHY level ASIC. It includes the core for the PCI controller interface (V2.2) for communication with the motherboard processor.

Transceiver Chip and Biasing Circuit

The core of the 3.5 GHz transceiver is an RF Magic chipset (RF2000 & RF3000), which contains integrated synthesizers, programmable gain amplifiers and Tx/Rx filter frequency and gain settings which are done via a write only 3-wire bus.



3.5 GHz Mini-PCI Modem Module

Encryption Card - SafeXcel™ 141 PCI Card

This card provides the encryption support for the base station emulator. The SafeXcel 141-PCI card is a plug-in PCI card that supports a comprehensive set of algorithms:

- DES and Triple-DES encryption
- Symmetric Encryption Block modes: ECB and CBC
- SHA-1 Hashing with HMAC
- Public Key computation:
 - RSA Encryption and Signatures
 - Random Number Generation

With this card installed, the CPU of the base station can offload the burden of time-consuming encryption application. This means that the CPU has more free cycles to perform its main tasks.



Specifications*

Modulation	OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
Bandwidth	Programmable, supports 3.5 MHz and 7 MHz**
Spectral Efficiency	5 bits/sec/Hz (64-QAM uncoded)
Error Control Coding	Concatenated Reed-Solomon Convolutional Code
SNR for BER 10 ⁻¹⁰	24 dB (64-QAM-2/3)
Power Requirement	18 W @ 110 or 220 V (base emulator) 4.75 W (average consumption of Mini-PCI module)
RF Frequency	3.4 to 3.6 GHz in steps of 250kHz
Duplexing Mode	TDD & HFDD
RF Input Dynamic Range	-20 dBm to the sensitivity threshold***
RF Output Power Level at Antenna	20 dBm ≤ P_{Tx,max} ≤ 23 dBm (profC3_20)
RF Output Dynamic Range	50 dB
Ethernet	10/100 Base-T
Packet Format	IEEE 802.3 – Ethernet II
Ethernet Connector	RJ-45
Management Interface	Via TELNET or Serial port

*Subject to change without notice

**Other bandwidths can be selected but will not be tested, being out of WiMAX scope

***Please refer to 802.16-2004 specification for each modulation



Ordering Information

Model	Content
Reference Kit WS-mPCIRFM35-RK	1 DM256 Subscriber Platform (WS-mPCIRFM35-SP)
	1 DM256 Base Emulator (WS-DM256A35-BE)
	Subscriber MAC object code
	Drivers & source code
	Schematics, Gerbers (on demand) & BOM
	3-Month technical support ¹
Optional subscriber platform ² WS-mPCIRFM35-SP	1 DM256 subscriber platform
Optional OFDM Mini-PCI module ² WS-mPCIRFM35-PCBA	1 Mini-PCI Modem module ³
Optional base emulator ² WS-DM256A35-BE	1 DM256 base emulator
Optional maintenance and support contract ² WS-SOFTMAIN	1 Year extended support, including bug fixes, enhancements and new functionality for Reference Kit ⁴
Optional subscriber station MAC source code ² WS-MACCPE-SC	C source code for WiMAX certifiable subscriber station

¹ For Wavesat provided hardware & software

³ Available in minimum quantity of 10

² Only for customers who have purchased a Reference Kit previously

⁴ Includes support for MAC Source Code if source code license was purchased