PXI Modules

WiMAX Measurement Suite

Cost effective WiMAX Signal Analysis

- Transmit power
- Spectral mask
- Occupied bandwidth
- EVM (all, data only, pilots only)
- Frequency error
- Symbol/chip clock frequency error
- Carrier leakage
- Spectral flatness

Introduction

Aeroflex's approach to WiMAX RF test is a flexible, modular solution comprising PXI RF modules and software components that provide high performance vector signal analysis and/or vector signal generation in a single integrated solution.

The WiMAX measurement suite provides the analysis component by taking digitized sample data from any Aeroflex 3030 Series RF Digitizer and using it to perform vector signal analysis of WiMAX OFDMA signals. Power, modulation and spectral parameters can all be characterized in accordance with the requirements of IEEE 802.16e (2005) and WiBro.

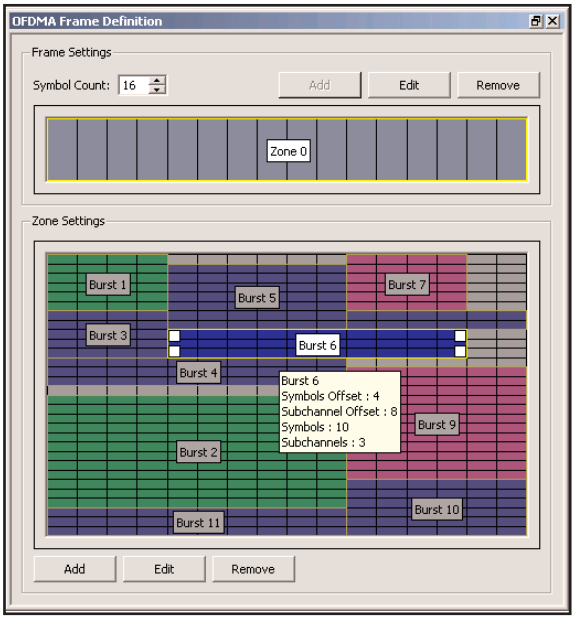
The WiMAX measurement suite provides easy to use interfaces for both manual operation within PXI Studio and application programming in C. The measurement suite comprises a library of high level functions which combine digitizer hardware control together with analysis primative functions in an intuitive application specific manner. This eliminates any requirement to understand low level digitizer commands making programming far simpler. The same high level measurement functions are then used to provide a graphical user interface plug-in component to the PXI Studio application software. PXI Studio presents WiMAX measurement results in a range of easy to understand graphical formats that enable the user to see clearly what is going on and so help to solve problems more quickly.

Applications

The WiMAX measurement suite is designed for PXI based RF test systems used in development or manufacturing. For complete RF component/subsystem characterization, the WiMAX measurement suite is complemented by IQCreator, a waveform creation software application for generating complex modulation including IEEE 802.16 OFDM & OFDMA signals compatible for use with any 3020 Series digital RF signal generator module.

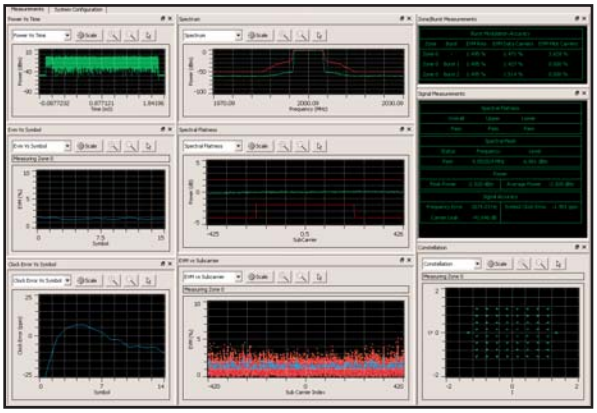
Highlights

Configuration for each Zone and burst within the sub-frame is made easily configurable using point and click/drag and drop. Color is used to differentiate between modulation types.



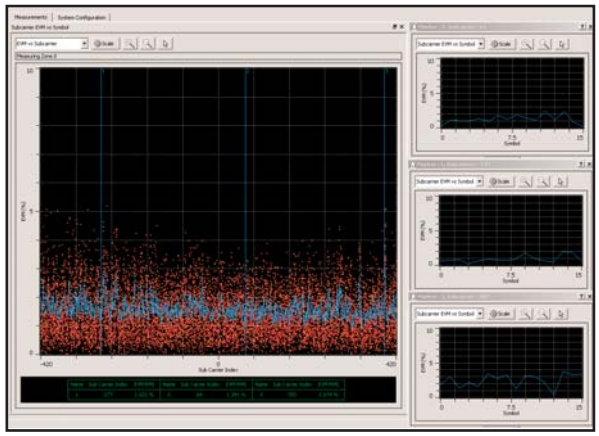
Zone Definition

The WiMAX measurement plug-in to PXI Studio enables the user to view each measurement parameter separately or collectively in reconfigurable panels. The user is provided complete freedom to configure and arrange measurement result panels on the Windows™ desktop.



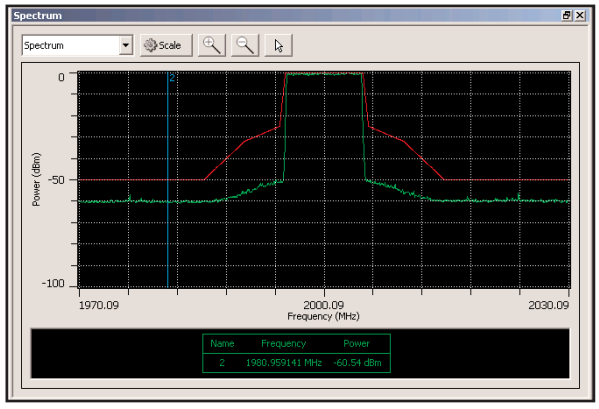
All Measurements

Complex EVM results can be viewed as a function of sub-carrier or symbol for each burst in a multi-burst frame. Markers can be used to link between EVM vs sub-carrier and sub-carrier EVM vs symbol views. Different colors are used effectively to differentiate between composite EVM per sub-carrier and individual EVM values for each symbol in a particular sub-carrier.



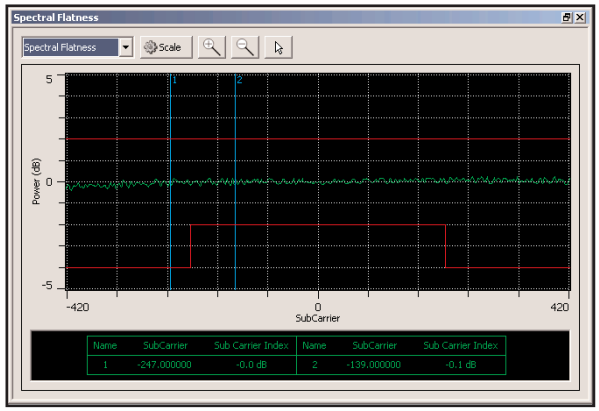
EVM Vs Subcarrier With Marker Inspection

Spectral measurements are displayed and checked against a pre-set or user defined spectral mask. Failures are indicated together with the frequency and level at the point of worst failure. In the case of signals passing the spectral mask, the frequency and level indicate the points of closest proximity to the mask.



Spectral Mask

Spectral flatness results provide a pass/fail indication independently for each portion of the mask and check the relative level between successive sub-carriers as well as providing trace data with markers.



Spectral Flatness

Example Code

The measurement suite is supplied with comprehensive help including useful example source code to aid the user in the development of measurement applications. Examples are supplied for a variety of ADEs (applications development environments) including Visual Basic (VB6) and C/C++.

SPECIFICATION

All specifications for accuracy and range relate to performance when used in conjunction with a 3030 Series PXI RF digitizer.

ACQUISITION SETUP

Standards Supported

IEEE 802.16e (2005) OFDMA

FRAME SETUP

Frame Length

2.5, 4.0, 5.0, 8.0, 10.0, 12.5, 20 ms

Nominal Bandwidth

1.25, 3.5, 4.375, 5, 7, 8.75, 10, 14, 15, 17.5, 20, 28[1] MHz

[1] Supported in 3030A, 3030C, 3035, 3035C

FFT size

128, 512, 1024, 2048

Guard Period

¼, 1/8 , 1/16, 1/32

Subframes (link direction)

Uplink, Downlink

Downlink preamble Index

0 to 113

Uplink cell ID

0 to 31

ZONE SETUP

Type

PUSC

Number of Zones

Downlink: 8

Uplink: 3

Length

1 to max. symbol count set by frame length and guard period

Offset

0 to max. symbol count - 1 set by frame length and guard period

Permutation Base

Downlink: 0 to 31

Uplink: 0 to 69

BURST SET UP

Burst type

Downlink, Uplink

Uplink PUSC: Normal data

Downlink PUSC: Normal data

Burst edit operations

Add, delete

Burst definition

Single/multiple

Modulation: QPSK, 16QAM, 64QAM

Burst Type: Normal data

Modulation[1]

BPSK (pilots), QPSK, 16QAM, 64QAM

Number of symbols[1]

1 to n where n is the number of symbols in the zone

Number of sub-channels[1]

1 to n where n is the number of subchannels in the zone set by the zone type and FFT size

Symbol offset[1,2]

0 to n - 1 where n is the number of symbols in the zone

Sub-channel offset[1,2]

0 to n - 1 where n is the number of subchannels in the zone set by the zone type and FFT size

[1] For each burst in a multi-burst zone

[2] non overlapping

MEASUREMENT SET-UP

Channel Equalisation Methods:

Channel estimation sequence only; channel estimation sequence and pilots

Channel Estimation Sequence Only

Downlink - using preamble

Uplink - no equalization

Channel Estimation Sequence and Pilots

Downlink - using preamble and pilot sub-carriers of the data symbols in the sub-frame

Uplink - Pilot sub-carriers of the data symbols of the sub-frame

PILOT TRACKING

Phase Tracking

On/Off

Amplitude Tracking

On/Off

Symbol Time Tracking

On/Off

BURST POWER MEASUREMENTS

TRANSMIT POWER

The Peak and RMS power is measured for a single UL or DL subframe

Indication

dBm

power vs time trace data

Accuracy

As per 303x level accuracy specification

OBW

Bandwidth containing 99% of total of the transmitted spectrum

Indication

Hz

Accuracy

Typically <100 kHz

SPECTRAL MASK

The spectral density of the transmitted signal should lie within the spectral mask.

The mask is frequency aligned to the maximum spectrum density.

Mask Type

10 MHz, 20 MHz, user defined

Measurement BW

100 kHz

Measurement Range

80 MHz

Indication

Global Pass / Fail

The worst case dBc level value and its corresponding frequency relative to the mask are reported.

Traces

FFT power spectrum and mask values

MODULATION ACCURACY

The error vector magnitude (EVM) is the magnitude of the IQ vector at the decision point measured relative to the ideal constellation point.

RCE (residual constellation error) / EVM (error vector mangnitude)

Composite RCE / EVM (rms), (all sub-carriers and symbols within a zone)

EVM (rms) for a single burst within a zone

EVM (rms) for a single sub-carrier

EVM (rms) all data sub-carriers (within a burst or zone)

EVM (rms) for a specific symbol on a specific sub-carrier within a burst

EVM (rms) all pilot sub-carriers (CPE-common pliot error)

Indication

%/dB

Traces

EVM (rms) vs. sub-carrier for a specific burst or for all symbols

EVM (rms) vs. symbol for a specific burst or for all sub-carriers

Constellation for a specific burst or for all sub-carriers

Accuracy

<-40 dB residual EVM

FREQUENCY TOLERANCE

Lock Range (% of sub carrier spacing)

±20%

Indication

Hz

Accuracy

As per reference frequency

TX CENTRE FREQUENCY LEAKAGE / RF CARRIER SUPPRESSION

Indication

dB

SYMBOL / CHIP CLOCK TOLERANCE

Range

±50 ppm

Indication

ppm

clock error vs time

Accuracy

As per reference frequency

SPECTRAL FLATNESS

Indication

Mask Pass/Fail

Mask Upper Pass/Fail

Mask Lower Pass/Fail

Adjacent sub-carrier Pass/Fail

Trace

dBr values for each sub-carrier

ORDERING

This application is designed for use in conjunction with the 3030 Series PXI RF Digitizer.

It may be purchased either with the RF digitizer at time of order or purchased as an upgrade.

When purchased with the 3030, order as:	*3030 option 104*
When purchased as an upgrade, then order as:	*RTROPT104/3030*

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