

LitePoint Corporation

Multipoint Test Adapter
Data Sheet

April 26, 2007



Revision History

Release Date	Revision	Change Description
March 1, 2007	0.9	Preliminary version
April 13, 2007	1.0	Updated version
April 26, 2007	1.1	Added calibration information

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Multiport Test Adapter

Data Sheet

Introduction

The Multiport Test Adapter is designed to enable accurate, low-cost manufacturing testing of 802.11n (MIMO) products using the combined fast switching and composite EVM test methodology when coupled with LitePoint IQview and IQflex one-box testers.

The Multiport Test Adapter enables testing of a MIMO DUT with the benefits of both a close coupled control, fast RF switching test and composite EVM test methodologies. Close coupled control allows the Multiport Test Adapter to become an extension to the internal test resources of the IQflex and IQview instruments enabling fast test times. Combining both composite and fast switching test methodologies enables full Tx and Rx manufacturing testing in MIMO mode along with accurate EVM testing. Rx sensitivity testing for verifying MRC verifies MIMO processing.

Supporting the LitePoint test solutions are the IQfact family of manufacturing test programs for support of composite MIMO and combined fast switching with composite MIMO test methodologies

Complete testing of MIMO product for design verification, debug and Q/A is supported by the LitePoint IQnrxn test solution.

Application areas:

- MIMO Mass Production Testing
- Product Development
- Design Verification
- Quality Control

Features:

- Enables comprehensive, accurate, low-cost MIMO manufacturing testing when used with the LitePoint IQview and IQflex one- box Test Systems
- Direct RF connections to DUT and Test Instrument
- Single USB 2.0 interface for control and power
- Closely coupled to the IQview or IQflex Test Systems for fast test times
- Implements the benefits of fast switching test methodology for MIMO Tx and Rx isolation tests
- Implements the benefits of composite testing for Rx and Tx testing in MIMO mode, including Rx sensitivity
- Complete test solutions available using the LitePoint IQfact family of test programs

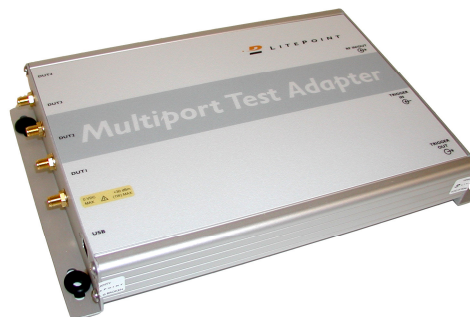


Figure 1. Multiport Test Adapter.

Basic Block Diagram

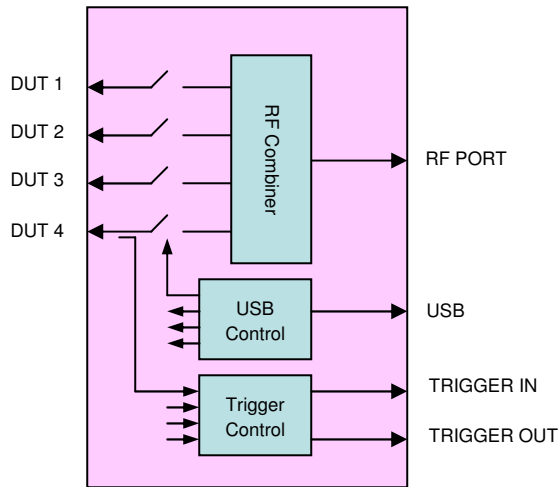


Figure 2. Simplified Functional Block Diagram

Port Descriptions

NAME	DESCRIPTION	CONNECTOR TYPE
RF Port	RF connection to the Test Instrument RF test port	SMA Female
DUT 1	RF connection to Device Under Test (DUT) antenna #1 port	SMA Female
DUT 2	RF connection to Device Under Test (DUT) antenna #2 port	SMA Female
DUT 3	RF connection to Device Under Test (DUT) antenna #3 port	SMA Female
DUT 4	RF connection to Device Under Test (DUT) antenna #4 port	SMA Female
Trigger In	Trigger connection to receive Test Instrument trigger signal	BNC Female
Trigger Out	Trigger connection to send Test Instrument trigger signal	BNC Female
USB	USB 2.0 compatible connection to the Test Instrument USB port	USB type A

Specifications

PARAMETER	CONDITION	VALUE
Operating Frequency Range		2GHz to 6GHz
Insertion Loss	RF Port to DUT Port, Switch open	>75dB
	RF Port to DUT Port, Switch closed	<14dB
Input Impedance	RF Port	50 ohm nominal
	DUT Port	50 ohm nominal
Isolation	Between any two DUT Ports	30dB
Return Loss	RF Port	>12 dB
	DUT Port	>12 dB
Maximum Input Signal	RF Port and	+25dBm average
	DUT Port	+25dBm average
Trigger - Minimum DUT Signal Level		-30dBm
Trigger – DUT Signal Dynamic Range		> 50dB
Absolute Maximum Input Signal <small>(note 1)</small>	RF Port	+28dBm average
	DUT Port	+28dBm average
Absolute Maximum Input DC Level <small>(note 1)</small>	RF Port	+/- 35VDC
	DUT Port	+/- 35VDC

Note 1: Absolute Maximum specifies a level above which permanent damage to the product will occur.

Physical and Environmental

dimensions	10" L x 6 1/2" W x 1 1/2" H (preliminary, subject to change)
weight	1.1 kg
power consumption	USB powered
operating temperature	0°C to +55°C (IEC 68-2-1, 2, 14)
storage temperature	-40°C to +70°C (IEC 68-2-1, 2, 14)
operating humidity	15% to 95% relative humidity, non-condensing (IEC 68-2-30)
recommended calibration cycle	12 months
warranty	12 months hardware

Shipping Contents

Multiport Test Adapter
USB Type A / USB Type B Cable, 2 meter length

Order Information

<u>ORDER CODE</u>	<u>PRODUCT DESCRIPTION</u>
MPTA	WiFi MIMO Multiport Test Adaptor.

Typical System Usage

The Multiport Test Adapter with IQflex or IQview addresses all the critical measurement parameters for MIMO testing and it can be easily integrated into manufacturing production lines. The unit can support up to four Tx, Rx or any combination of Tx/ Rx ports of the Device Under Test (DUT). Example in Figure 3 has two Tx/Rx and an Rx configuration.

The unit contains an RF splitter, combiner and a fast switch with four programmable RF attenuators. The attenuators and the combiner can be setup to switch and change automatically which is triggered by the RF signals from IQflex or IQview.

The unit is powered and controlled through a USB connection with the IQflex or IQview. Control software for the unit is included with the IQfact test software or custom software written by the customer using the IQflex or IQview API.

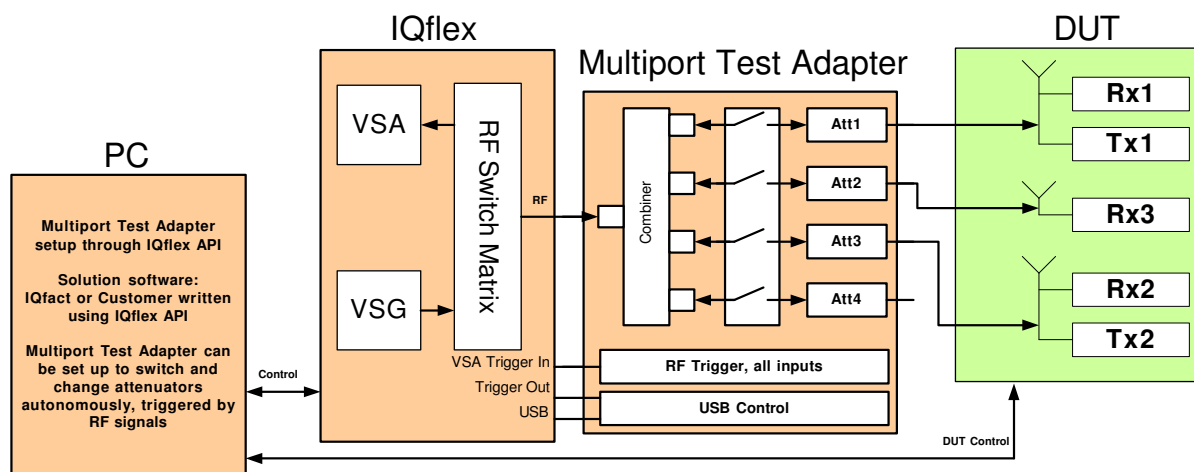


Figure 3. Multiport Test Adapter configuration

Application

The Multiport Test Adapter can be used to test a DUT transmitter and receiver in MIMO mode. An IQflex tester and MPTA in combination can measure the individual transmitter EVM or composite EVM, isolation between RF chains, either Tx or Rx, without requiring Rx/Tx chain control in the DUT. The same combination can be used to measure the receiver PER. The MPTA can be set to static or dynamic mode to test the transmitter and receiver PER sensitivity.

In static mode the switch is set into a static state, i.e. the switches and attenuators are set and do not change for the duration of the test. In dynamic mode a series of configurations, or states, is defined. Each configuration has its own switch and attenuator settings. The transition from state to state is controlled by the intelligent MPTA itself based on its signal inputs.

Transmitter Testing

In static mode the transmitter properties can be measured per chain if only one signal is routed to the VSA or composite properties if multiple transmitters are routed to the VSA simultaneously.

In dynamic mode, for transmit tests the MPTA is configured to follow a sequence of connectivity states, each state connecting one (or several) of the transmitters. This allows sequential capturing of MIMO signals from each transmitter and per chain evaluation of power, EVM, etc. plus isolation between RF chains.

Receiver Testing

In the static mode the sensitivity of each receiver can be measured individually by routing the VSG signal to one receiver at a time without having to enable or disable the receivers in the DUT. This helps to measure the isolation between receive chains. In addition, the improvement in sensitivity due to Maximum Ratio Combining (MRC) can be verified by feeding the VSG signal into all receivers simultaneously. This sensitivity improvement verifies a substantial part of the MIMO signal processing.

In dynamic mode, the switch is configured to measure the acknowledgements (ACKs) sent by the receiver. These ACKs are only sent when no errors are detected in the DUT. This way the PER can be measured for different settings of the attenuators and for different receiver configurations, i.e. with one, two, three, or four receivers enabled. This whole sequence can be carried out by the switch/attenuator combination automatically. The test software defines the test sequence, sends the sequence to the MPTA and starts the test. After that, the MPTA goes through the sequence automatically. Not only does this mode verify the Rx/Tx switching and the MRC sensitivity improvement, it does this without time penalty due to multiple control and DUT software interactions.

Table 1 Measurement capability of the Multiport Test Adapter with IQview/IQflex configuration

Parameter	IQn xn	Multiport Test Adapter + IQflex/IQview
TX power, each	✓	✓
TX Spectrum, Combined	✓	✓
TX Spectrum, each	✓	✓
TX Carrier Leakage, each	✓	✓
TX EVM, Composite MIMO		✓, ¹
TX EVM, Individual MIMO	✓	✓, ²
TX Isolation	✓	✓
TX Spectral Flatness, each	✓	✓
TX IQ Imbalance, each	✓	✓
TX Phase Noise	✓	✓
TX CCDF, each	✓	✓
TX Symbol Clock Offset	✓	✓
TX mutual packet alignment	✓	✓
TX PSDU data verification	✓	
RX Sensitivity, individual chains, AWGN Channel	✓	✓
RX Sensitivity, AWGN Channel, MRC Combining	✓	✓
RX Sensitivity with MIMO multipath channels	✓	
RX Isolation	✓	✓
RX CCA	✓	✓
RX MIMO multi stream data path verification	✓	
TX/RX switching during PER test		✓
IQsignal GUI	✓	

¹ Requires known data in PSDU to be transmitted by DUT

² If random data in PSDU, the EVM is limited by the TX isolation. If consecutive packets have same data in PSDU, EVM is not limited by isolation.

Calibration

The unit is fully calibrated and certified at the factory. Annual calibration is recommended.



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