IXVERIWAVE® WAVEBLADES®

DATA SHEET

STRONG FOUNDATION FOR COMPREHENSIVE WI-FI TESTING

PROBLEM: COMPLEXITY OF WI-FI ECOSYSTEMS IS DIFFICULT TO TEST

Wi-Fi has fast become the industry-leading technology for fixed and mobile high-speed IP access. Users have high expectations that any application, at anytime, anywhere should work flawlessly. But the only way to ensure that it will work as it should, requires assessment and validation of the entire Wi-Fi ecosystem—networks, access points (APs) and Internet of things (IoT) devices.

SOLUTION:

IxVeriWave WaveBlade series of load modules is an industry-first test solution for evaluating the functionality and performance of IEEE 802.11-based WLAN networking products. WaveBlades integrate control-plane simulation, traffic generation/analysis, and multi-path channel emulation capabilities on a single platform, making it a very powerful, one-stop solution for validating 802.11-based products. Whether testing the AP, IoT device, or network, IxVeriWave WaveBlades give R&D labs the means to quickly and effectively validate Wi-Fi ecosystems.

HIGHLIGHTS

- Precisely measure critical performance metrics at data rates reaching maximum theoretical limits, using up to 500 fully independent, stateful 802.11a/b/g/n/ac clients per port
- Gain full control over APs to build robust and functional IoT devices
- Achieve network scale with 64 fully-independent APs simulated per port
- Save time with simplified setup that includes single-click selection of desired channel model and pre-packaged scenarios
- Quickly determine real-world performance using built-in channel models for six typical WLAN multi-path scenarios
- Designed for full Wi-Fi performance and in depth real time analysis of Wi-Fi
- Model real world scenarios with interference injection
- World’s most advanced MU-MIMO test capability
- 802.11ac Wave 2 160MHz and 80+80MHz channel bandwidth
- Multiple Port Allocations, software controlled for 1 port 4x4, 4 port 1x1 and 2 port 2x2 operation
- IxVeriWave and Ixia IoT software both supported

IXVERIWAVE GOLDEN CLIENT

WaveBlades

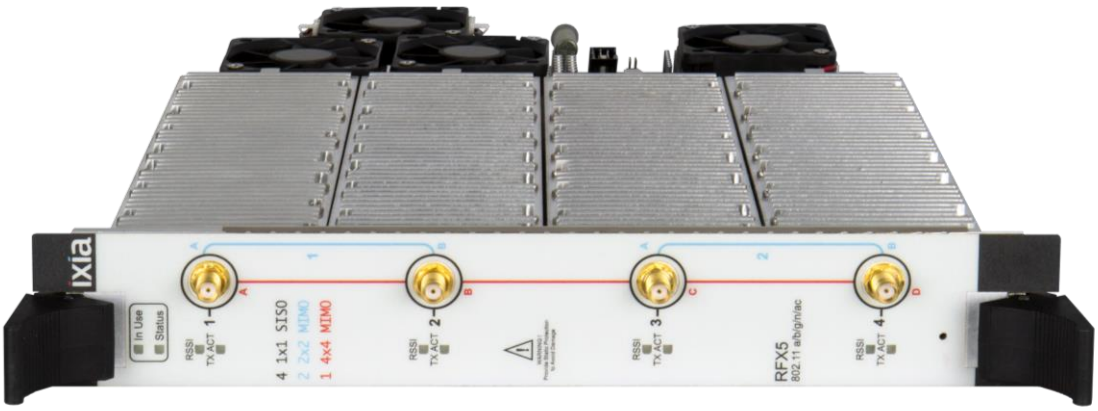
Modules provide the essential tools necessary to complete various types of testing, ranging from functional testing at the AP level to scale testing a large 802.11ac infrastructure network.

- Up to 500 fully independent, stateful 802.11 clients per port enable precise measurement of critical performance metrics at data rates, reaching up to maximum theoretical limits
- Highly scaled setup in a single test-bed to validate real-world deployment levels of controllers, APs, and clients
- Ease-of-use through simplified setup including single-click selection of desired channel model to be used on clients in a wide-array of IxVeriWave test suites
- Built-in channel models help determine real-world performance in six typical WLAN multi-path scenarios, per recommendations of IEEE 802.11n task group
- Full support of IEEE 802.11 a/b/g/n/ac traffic generation and analysis through simplified setup in a wide array of IxVeriWave test suites, applications, and WaveAutomation
- DFS Pulse Generation capability for DFS Certification

IXIA IoT GOLDEN AP

During the early stages of a product's lifecycle, device manufacturers need a stable test platform that can help them qualify functionality and baseline performance. Ixia's Golden AP is designed to do just that. This is the only solutions in the market capable of simulating a fully configurable AP or an entire Wi-Fi network with multiple generations of APs (802.11 a/b/g/n/ac SISO to 4x4 MIMO), from a single card.

Built ground-up by Ixia and featuring several innovations that enable realism while also improving time-to-market for any product, it's a must-have for any R&D lab.



5-Series RF WaveBlade

KEY FEATURES

- Fully configurable AP “Golden AP”, 802.11 a/b/g/n/ac from SISO to 4x4 MIMO
- Enables network scale, 64 APs and clients simulated per port, to model Wi-Fi deployments and to test and optimize device performance
- Built-in Traffic Generation with line-rate throughput for benchmarking high performance Wi-Fi devices
- Real-time statistics and analysis, continuous monitoring of WLAN traffic, and large FPGAs to analyze and compute statistics in real-time
- Distance simulation measures performance of IoT device at various distances without having to move the device
- Channel emulation recreates real-world channel conditions as defined by TGn specifications and highlights performance degradation

RF WAVEBLADE

Incorporating the functionality of three separate test products, Ixia’s RF WaveBlade is the world’s only test solution capable of testing from the RF layer to the application layer in a single, integrated solution.

Ixia’s 802.11ac solution introduces a radically new architecture that advances the state of the art for RF measurements in communication systems. Built from the ground up to be a full-rate, lab-grade RF and traffic test system without compromise, the solution includes RF WaveBlade Traffic Generator/Analyzer modules (L1-7). Rather than limit the design by using the memory-buffer techniques common in existing Vector Signal Analyzers (VSA) and Vector Signal Generators (VSG), the RF WaveBlade is engineered with on-board horsepower to process each and every frame in real time, allowing worst case measurements obtained over extended periods of time. This approach drives improved testing cycles by dramatically improving test coverage while simultaneously reducing test time. Traditional memory-based VSAs limited by short sample intervals simply miss many events. The RF WaveBlade run all measurements at full rate and can therefore produce min, max, and average results over time. This approach provides RF engineers with a much-improved level of confidence in measurements as, without the limits of memory buffers, long aggregate frames critical to 802.11n and 802.11ac performance boosts can be received and analyzed to ensure they are being transmitted coherently for their entire duration

As a signal generator, the RF WaveBlade is much easier to use than traditional VSG solutions. In combination with WaveGen software, users can create a wide range of stimuli --- from simple tones to advanced, time-variant 802.11a/b/g/n/ac frames — using a simple point-and-click user interface. There’s no need to develop complex mathematical models to create IQ sequences as this functionality is entirely embedded.

Since the solution has no memory-length limitations, long aggregate frames can be easily created to test receivers’ ability to handle the performance-boosting aggregate frames. Users can generate complex sequences of frames that test receivers’ abilities to dynamically adjust to varying power levels, channel impairments, PHY rates, and so forth as a complex sequence of frames are received. With no need to download waveforms into a memory buffer from the user’s PC.

As with all IxVeriWave products from Ixia, RF WaveBlades also function as a Layer 2 to 7 load module. Once RF testing is complete, users can begin leveraging the same load module to assess the performance of the fully integrated design. Capable of behaving as up to 500 fully independent, fully

stateful clients, this is the fastest, most complete method of verifying the functionality, benchmarking the performance, and conducting system testing of 802.11ac access points (APs).

Engineers can immediately leverage the full suite of existing IxVeriWave applications in conjunction with RF WaveBlade and utilize the IxVeriWave solution's wide array of test tools and methodologies. As an added bonus, users can switch between RF metrics and L2-7 metrics without having to change test setups or re-cable, thus dramatically improving test coverage while reducing test times once again.

KEY FEATURES

- Real-time PHY layer frame generation and analysis
- Measure RF transmission characteristics such as EVM and spectral compliance
- Benchmark RF receiver performance using highly diverse and realistic traffic
- Generate MAC, IP, and layer 4-7 traffic to characterize a fully integrated device's ability to forward traffic efficiently at rates up to the maximum possible with 802.11ac
- Apply different RF impairments at layer 1 on a frame-by-frame or client-by-client basis
- Validate MU-MIMO 11ac Wave 2 Beamforming Accuracy
- Simple point-and-click application support for PHY layer testing
- Up to 500 fully independent, stateful 802.11a/b/g/n/ac clients per port enable precise measurement of critical performance metrics at data rates reaching up to maximum theoretical limits
- Built-in channel models help determine real-world performance in six typical WLAN multi-path scenarios in accordance with recommendations by the IEEE 802.11n task group
- Full support of legacy IEEE 802.11 a/b/g/n/ac traffic generation and analysis for all existing IxVeriWave test suites, applications, and Wave Automation capabilities

ETHERNET WAVEBLADES

Ethernet Server WaveBlades provide a complete Layer 2-7 test module used to evaluate the functionality and performance of Ethernet-based networking products. Each Ethernet WaveBlade port generates fully interleaved, multi-protocol IP traffic from hundreds of independent Ethernet clients or servers at wire-speed and analysis.

WBE1604 – 4 Port Ethernet Waveblade

KEY FEATURES

- Up to 500 fully independent Ethernet clients /subscribers or servers per port enable precise measurement of critical performance metrics at data rates reaching up to 1 Gbps
- Capable of generating wire-speed stateful TCP traffic and other traffic including raw Ethernet frames, UDP, RTP etc.
- Complete control over MAC and IP address scheme including automatic addressing and incremental addressing per user-defined step sizes
- Wire-speed interleaved flow generation with unique ID, rate, timestamps, sequence numbers, data integrity signature, and flow group identifiers
- Real-time statistics to track up to 131,072 traffic flows and 16 user customizable latency histogram buckets
- Industry-best simultaneous bi-directional (TX/RX) wire-speed packet capture support of 1GB on each port
- Ease-of-use through simplified set-up in a wide-array of IxVeriWave Test Suites and WaveAutomation

WAVEBLADE SPECIFICATIONS

GENERAL CHARACTERISTICS

	RFX5, WBX5	WBL5
802.11 versions supported	802.11a/b/g/n/ac	
Frequency Range / Channels Supported	**2.4 GHz:** 1-14	
	4.9 GHz: 20-26	
	5.0 GHz: 34, 36, 38, 40, 42, 44, 46, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 144, 149, 153, 157, 161, 165	
Channel Bandwidth	20 MHz, 40 MHz, 80 MHz, 160 MHz, 80+80 MHz	20 MHz, 40 MHz, 80 MHz
PLCP Type	Legacy, HT, VHT	
RF Connector(s)	Male 50 Ω SMA Connector	
802.11 versions supported	a/b/g/n/ac	
Test Ports per WaveBlade	1, 2, or 4	

	RFX5, WBX5	WBL5
MIMO Configurations	• Up to 4 ports of 1x1 • Up to 2 ports of 2x2 • 1 port of 3x3 or 4x4	
Maximum Number of Spatial Streams	4	
SU/MU-MIMO Support	Both SU and MU MIMO	No Beamforming

BASEBAND CONTROL CHARACTERISTICS

	RFX5, WBX5, WBL5
Supported Modulation Schemes	DBPSK, DQPSK, CCK (4bits), CCK (8bits), BPSK (1/2), BPSK (3/4), QPSK (1/2), QPSK (3/4), 16-QAM (1/2), 16-QAM (3/4), 64-QAM (2/3), 64-QAM (3/4), 64-QAM (5/6), 256-QAM (3/4), 256-QAM (5/6)
IEEE Channel Models	• By-pass mode - to not impose any channel conditions • Model A - typical home/small office environment • Model B - typical medium office environment • Model C - typical large office environment • Model D - typical open space environment • Model E - typical large open space environment • Model F - complex environment with many scatters
Supported CCK Preamble Types	Short and long
OFDM guard Intervals	400 and 800 ns
PLCP Type	Legacy and Mixed Mode
Forward Error Correction	BCC(Viterbi) / LDPC

RF FREQUENCY CONTROL CHARACTERISTICS

		RFX5	WBX5, WBL5
Frequency Accuracy (NOMINAL)	**Initial Accuracy**	+/- 0.2 ppm	+/- 1.0 ppm
	Aging per year	+/- 0.05 ppm	+/- 1.0 ppm

RF RECEIVER CHARACTERISTICS

	RFX5			WBX5, WBL5		
Rx Maximum Input Power Level	+10dBm					
RSSI Accuracy (NOMINAL)	+/- 1.0 dBm (over input range of +10 to -40 dBm)			+/- 1.0 dBm (over input range of +10 to 0 dBm)		
	+/- 2.5 dBm (over input range of -41 to -82 dBm)			+/- 2.5 dBm (over input range of -1 to -82 dBm)		
Rx Minimum Sensitivity (NOMINAL)	Modulation	Coding Rate	Minimum sensitivity (dBm) 20 MHz channel Spacing	Minimum sensitivity (dBm) 40 MHz channel Spacing	Minimum sensitivity (dBm) 80 MHz channel Spacing	Minimum sensitivity (dBm) 160 MHz channel Spacing
	BPSK	1/2	-82	-79	-76	-73
	BPSK	3/4	-81	-78	-75	-72
	QPSK	1/2	-79	-76	-73	-70
	QPSK	3/4	-77	-74	-71	-68
	16-QAM	1/2	-74	-71	-68	-65
	16-QAM	3/4	-70	-67	-64	-61
	64-QAM	2/3	-66	-63	-60	-57
	64-QAM	3/4	-65	-62	-59	-56
	64-QAM	5/6	-64	-61	-58	-55
	256-QAM	3/4	-59	-56	-53	-50
	256-QAM	5/6	-57	-54	-51	-48
	Receiver performance criteria are based on achieving a frame error rate of less than 10% using 4096 octet frames.					
RX EVM (NOMINAL)	The relative constellation RMS error, averaged over subcarriers, OFDM frames and packets for a data rate of 64-QAM with a coding rate of 5/6 is less than -41dB for power levels less than -10dBm.					

RF TRANSMITTER CHARACTERISTICS

	RFX5	WBX5, WBL5
Transmit Center Frequency Tolerance (NOMINAL)	2.5ppm over all operating conditions	
Transmit Power	+14dBm to -60dBm	+14dBm to -60dBm
Transmit Power Control Resolution	1dB	1dB
Transmit Power Absolute Accuracy (NOMINAL)	Any single frame shall be generated with an accuracy of +/- 1.0dB measured over the burst of that frame. (over output range of +10 to -40 dBm) Multiple consecutive frames from the AP shall be generated such that the initial frame shall have an absolute accuracy of +/- 1.0dB. Subsequent frames shall be generated with an absolute accuracy of +/- 1.0dB.	Any single frame shall be generated with an accuracy of +/- 2.0dB measured over the burst of that frame. Multiple consecutive frames from the AP shall be generated such that the initial frame shall have an absolute accuracy of +/- 2.0dB. Subsequent frames shall be generated with an absolute accuracy of +/- 1.0dB.
Transmit Constellation Error*	The relative constellation RMS error, averaged over subcarriers, OFDM frames and packets for a data rate of 64-QAM with a coding rate of 5/6 is less than:	
	Power level greater or equal to -10dbm	
	Nominal	Nominal
	-36dB (1.585%)	-35dB (1.778%)
	Power level less than -10dBm	
	Nominal	Nominal
	-41dB (0.891%)	-37db (1.413%)
	*Measured on a per radio basis transmitting a single 20MHz spatial stream.	

	RFX5		WBX5, WBL5	
Minimum Signal to Noise Ratio (NOMINAL) **WBL5 does not support 160 MHz or 80+80MHz*	**Power**	**Bandwidth (MHz)**		
	(dBm)	20	40	80	160, 80+80*
	-34 to +15	62 dB	59 dB	56 dB	53 dB
	-40 to -35	57 dB	54 dB	51 dB	48 dB
	Below -41	Power +97dB	Power +94dB	Power +91dB	Power +88dB

IXVERIWAVE FEATURE CHARACTERISTICS

RFX5, WBX5, WBL5	
Aggregation	Tx and Rx: A-MPDU and Block-ACK Tx and Rx: A-MSDU
Traffic Timestamp Accuracy	50 nS
Maximum Number of Stateful Clients	500
Maximum Number of Traffic Flows Generated per Port	1000
Maximum Number of Traffic Flows Analyzed per Port	131,000
802.11 MAC Control (all parameters)	Independent per client
802.1x Authentication	PEAP/MSCHAPv2, TLS, LEAP/EAP-FAST, TTLS
Encryption Support	WEP-40 and WEP-104, TKIP (WPA), AES-CCMP (WPA2)
OSI Layer 3 and Layer 4 (IP, UDP, TCP, etc.) Control (all parameters)	Independent per client
Port Counters	Comprehensive set of layer 2, 3 and 4 frame types
Flow and Flowgroup Counters	Frames sent / received, bytes sent / received, out-of-order frames, payload integrity, latency histogram

RFX5, WBX5, WBL5	
IPv6	• NDP: Neighbor/router discovery and address assignment • ICMPv6 & DHCPv6 • Multicast Listener Discover (MLDv1. MLDv2) • Dual stack operation of both IPv4 and IPv6 • UDP, RTP, stateful TCP, and multicast flows • Max of 32 IPv6 addresses per client: One Link-local, up to 31 Global
Capture Buffer	• 1 GBytes • Captures all transmitted and received frames during normal testing • Adds IxVeriWave Radio Tap header to provide additional debugging information such as PHY rate, RF power, aggregation, detected errors on per-frame basis

IXIA IOT FEATURE CHARACTERISTICS

RFX5, WBX5, WBL5	
Aggregation	Tx and Rx: A-MPDU and Block-ACK Tx and Rx: A-MSDU
Traffic Timestamp Accuracy	50 nS
802.11 MAC Control (all parameters)	Independent per client
OSI Layer 3 and Layer 4 (IP, UDP, TCP, etc.) Control (all parameters)	Independent per client
Flow and Flowgroup Counters	Frames sent / received, bytes sent / received, out-of-sequence frames, payload integrity, smoothed inter-arrival jitter, burst loss, offered load, forwarding rate, aggregation
Client (DUT) Counters	Probe handshake count, authentication handshake count, association handshake count, DHCP handshake count, ARP handshake count, BlockACK handshake count, Rx Deauthentication frames, Rx Disassociation frames, Rx Management frames PHY rate, HT/VHT Management frames received, Management frame RSSI, Tx CTS count, Tx RTS count, Tx Data PHY rate, Tx Management PHY rate, Tx Data MCS Index, Tx Data PHY type, Guard Interval, Tx Data signal bandwidth, Tx data number of spatial streams

RFX5, WBX5, WBL5	
Port Counters	Tx/Rx flow medium utilization, Tx Failed ACK frames, Rx FCS errored frames, Tx Failed ACK frames per second, Rx FCS errored frames per second

SIGNAL ANALYZER MEASUREMENTS

RFX5	
Power	Average Power
	Peak Power
	Power Spectral Density
	Power Peak Excursion
	Power-on / Power-down
Frequency	Center Frequency Tolerance
	Symbol Clock Frequency Tolerance
	Preamble Frequency Error
	RF Carrier Suppression
Spectral	Transmit Spectrum Mask
	Spectral Flatness
	Transmit Center Frequency Leakage
	CCDF
	Occupied Bandwidth
Modulation	Constellation Error
	Error Vector Magnitude (EVM)
	Transmitter Modulation Accuracy
I/Q	Gain Mismatch
	Phase Mismatch

SIGNAL/FRAME GENERATION CONTROLS

RFX5	
Frame Generation	Encoding
	Length
	Frame Transmission Rate
Modulation	a/b/g/n/ac PHY Rates
	Preamble
	FEC
Impairments	Frequency Offset
	Pre/post Encoder Bit Errors
	IEEE Channel Models A-F

ETHERNET WAVEBLADE SPECIFICATIONS

	WBE1601	WBE1604
Number of ports	1	4
Maximum number of ports per chassis	9	36
Number of interleaved flows (per WaveBlade)	1000	4000
Connector type	RJ45	
Ethernet PHY type	10/100/1000 Mbps	
Transmit capability	Wire-speed hardware frame generation with timestamps, sequence numbers, data integrity signature, and flow group Identifiers	
Receive capability	Wire-speed frame filtering, data integrity, and sequence checking, capture, real-time latency measurement on each flow	

	WBE1601	WBE1604
Maximum number of stateful clients per port	500	500 per port 2,000 total per Wave-Blade
User defined field modifier (per flow)	Increment or decrement by user-defined step; up to 256 bytes from start of frame	
Frame length control	Fixed, increment by user-defined step or automatic	
Statistics and rate counters	Link State, Line Speed, Frames Sent, Signature Valid Frames Received, Signature Error Frames Received, Bytes Sent/Received, Fragments Received, Undersize, Oversize, VLAN Tagged Frames, Per User Priority QoS counters, FCS errors, Bad Sequence Errors, Bad Payload Checksum, ARP, DHCP and Ping requests and replies, IP/ICMP/UDP/TCP checksum errors, IP Multicast packets, Sent/Received IP Packets	
Flow analysis	Real-time statistics to track up to 131,072 flows	
Time-stamp accuracy	50 ns resolution	
IPv4, UDP, TCP	Hardware checksum generation	
IPv6	NDP: Neighbor/router discovery and address assignment ICMPv6 & DHCPv6 Multicast Listener Discover (MLDv1. MLDv2) Dual stack operation of both IPv4 and IPv6 UDP, RTP, stateful TCP, and multicast flows Max of 32 IPv6 addresses per client: One Link-local, up to 31 Global	

ALL WAVEBLADES

	RFX5, WBX5, WBL5, WBE1601, WBE1604
PHYSICAL SPECIFICATIONS	
Weight	1.8 lbs (0.82 kg) – WBE1601/WBE1604 9 lbs (4.08 kg) – WBX5/WBL5/RFX5

	RFX5, WBX5, WBL5, WBE1601, WBE1604
Size	Height: 10.5 inches (26.7 cm) Width: 1.6 inches (4.1 cm) Depth: 15.5 inches (39.4 cm)
Mounting screw torque	3.5 inch-lbs
SMA Cable torque	8 inch-lbs
ENVIRONMENTAL CHARACTERISTICS (AS INSTALLED IN A WAVETEST 93 OR WAVETEST 22 CHASSIS)	
Temperature	Operating +5º to +25º C ambient Storage: -20º to +70º C
Humidity	Operating: 20% to 80% relative humidity Storage: +40º C at 95% relative humidity, non-condensing
Altitude	Operating: -1000 ft. to +6560 ft. (2000 meters)
Vibration, random	Operating: 5 Hz to 500 Hz, 0.27 Gms Non-operating: 5 Hz to 500 Hz, 2.3G
Shock	20 G shock tolerance
RF Isolation	Isolation: > 80 dBm isolation between WaveBlade WiFi radios

POWER SPECIFICATIONS

	RFX5, WBX5, WBL5, WBE1601, WBE1604
Max Power	WBE1610/WBE1604 – 28 Watts WBX5/WBL5/RFX5 – 180 Watts
CERTIFICATIONS	
Product Safety Compliance	Listed TUV-USA and TUV-Canada Low Voltage Direction EN 61010-1:2010

	RFX5, WBX5, WBL5, WBE1601, WBE1604
Electromagnetic Compliance	EU EMC Directive 89/336/ECC, as amended EN 61000-6-2:2001: Class B Radiated Emissions EN 55011(AMD. A1:1999) Class B Conducted Emissions EN 61000-3-2:2000: Current Harmonics EN 61000-3-3:2001: Voltage Fluctuations EN 61000 -6-2:2001: Immunity Class A part 15 FCC Standards for Radiated and Conducted Emissions

FUNCTIONAL TEST CERTIFICATION

WaveBlades undergo functional test certification before shipment to ensure the equipment performs as expected under Ixia's procedures. WaveBlade performance characteristics are detailed in this datasheet. The functional test certification includes RF radio functional tests. Customers can elect to recertify their WaveBlades depending on their specific requirements. It is recommended that RF WaveBlades are returned on a yearly basis for functional test certification to ensure continued as-expected operation. Ethernet WaveBlades do not require recertification.

ORDERING INFORMATION

980-2070

WBX5 L2-7 Multiport 11ac Wave 2 multi-client High Performance Traffic Generator and Performance Analyzer for IxVeriWave Golden Client and Ixia IoT Golden AP and Interop. Multiple configuration options include single port 4x4 MIMO, 2 port 2x2 MIMO and 4 port SISO. Includes Wave 2 160MHz, MU/SU-MIMO and legacy 11a/b/g/n

980-2071

RFX5 L1-7 Multiport 11ac Wave 2 multi-client High Performance Traffic Generator and Performance Analyzer with RF signal generation and analysis for IxVeriWave Golden Client and Ixia IoT Golden AP and Interop. Multiple configuration options include single port 4x4 MIMO, 2 port 2x2 MIMO and 4 port SISO. Includes Wave 2 160MHz, MU/SU-MIMO and legacy 11a/b/g/n

980-2072

WBL5 L2-7 Multiport 11ac Wave 1 multi-client High Performance Traffic Generator and Performance Analyzer for IxVeriWave Golden Client and Ixia IoT Golden AP and Interop. Multiple configurations include single port 4x4 MIMO, 2 port 2x2 MIMO and 4 port SISO with legacy 11a/b/g/n. Does NOT include Wave 2 160MHz or MU/SU-MIMO

980-2011

IxVeriWave WBE1601, 1-port WaveBlade Ethernet; multi-client IPv6-capable Traffic Generator / Performance Analyzer for 10/100/1000 Mbps Ethernet networks

980-2012

IxVeriWave WBE1604, 4-port WaveBlade Ethernet; multi-client IPv6-capable Traffic Generator / Performance Analyzer for 10/100/1000 Mbps Ethernet networks

909-0545

IxVeriWave Functional Test Certification, provides one-time recertification of WaveBlades to ensure continued as expected operation, including RF radio function. U.S. customer pays for shipping costs to Ixia; Ixia pays for shipping back to customer. (Int'l - customer pay shipping both ways).

DEFINITIONS

Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty. They describe performance that is typical of the majority of a given product, but is not subject to the same rigor associated with specifications.

Nominal describes non-warranted product performance and provides an indication of expected performance of the product.

Reference Keysight publication 5991-1732: https://literature.cdn.keysight.com/litweb/pdf/5991-1732EN.pdf

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