iQxel-MW

BROCHURE

IQxel-MW™ Connectivity Test System

Superior Performance for the Next Generation of Wi-Fi

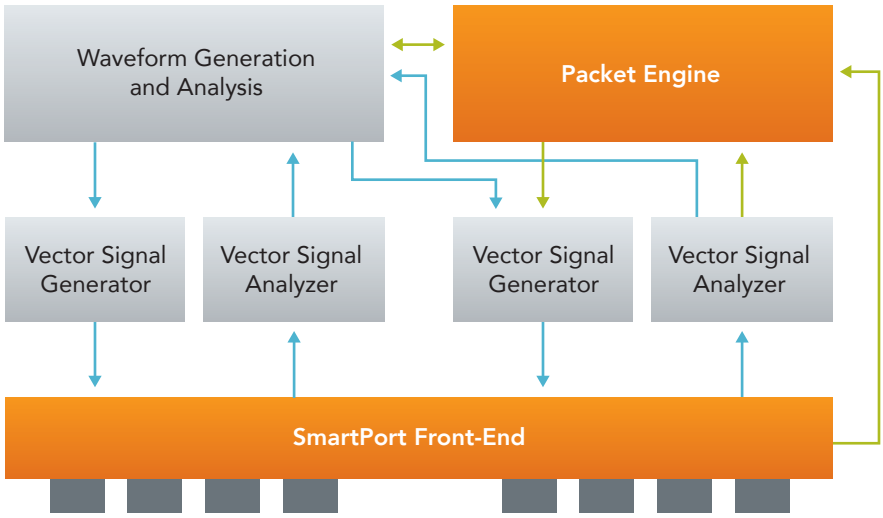
The LitePoint IQxel-MW is the world's first test solution for the next generation WiFi – 802.11ax. Ideal for both R&D and high-volume production, IQxel-MW delivers high performance verification for the most popular wireless connectivity standards including 802.11, Bluetooth, DECT and ZigBee. Additionally, IQxel-MW offers high efficiency parallel testing for up to 16 devices.

As 802.11ac and 802.11ax technologies are adopted by device makers, product requirements are becoming more complicated. IQxel-MW is equipped with new features that simplify production testing and lower production costs. The IQxel-MW series is available in three configurations, 2 ports, 8 ports, and 16 ports, which support up to 2x2 and 4x4 true MIMO testing.

The integrated front-end of the IQxel-MW covers all 802.11ac Wave 2 and 802.11ax test configurations, including 80, 160, 80+80 MHz, dual-band concurrent, and implicit beamforming … without the need for external components. This unique front-end design gives you flexibility in setting up your production line while lowering your overall production costs.

Built From the Ground Up for Manufacturing

LitePoint is the industry leader for testing wireless devices in high-volume production environments. The IQxel-MW takes full advantage of that expertise with flexible insertion features and efficient parallel multi-DUT testing. In addition, LitePoint partners with the major wireless silicon vendors to develop chipset specific software test solutions and we now have solutions for over 350 of the most widely used wireless chipsets. The IQxel-MW platform is also backward-compatible with existing LitePoint test solutions, making production deployment fast and easy.



RF1A – RF4B (WiFi, BT, ZigBee, DECT, etc.)

LITEPOINT

System Capabilities and Features

Integrated smart front-end for simple application setup

- Supports all 802.11ac Wave 2 and 802.11ax configurations (80+80, 160, dual-band concurrent, and 2x2 IBF calibration) without external combiner

EVM noise floor for next generation Wi-Fi

- EVM headroom for 1024QAM at 160 MHz bandwidth

Supports full range of connectivity technologies

- Addresses the requirements of the IEEE 802.11ac Wave 2 and 802.11ax specifications, Tests all IEEE 802.11 specifications, including 802.11 a/b/g/n/p/ac/ah/af/j
- Tests all Bluetooth device standards (1.x, 2.x, 3.0, 4.x, 5), DECT (ETSI EN 300 176-1), 802.15.4-based standards including ZigBee, Z-Wave and WiSUN

High test throughput for manufacturing

- LitePoint's patented Packet Engine technology provides industry-leading test speed and built-in parallel test capability for high test system efficiency
- Efficient parallel multi-DUT test enhances production capacity while reducing time-to-market

Scalable MIMO support

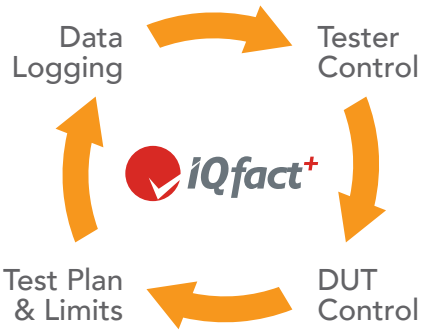
- Expandable architecture supports up to 8x8 true MIMO
- Supports testing of all key IEEE 802.11ac Wave 2 and 11ax MIMO specification enhancements
- Supports beamforming and advanced phase validation

Flexible Programming Interface

- Leverages API test routines within existing LitePoint systems and program using LitePoint's IQmeasure software
- Supports programming over Ethernet using text-based SCPI programming
- Fully backward compatible with existing LitePoint connectivity test systems

Available Turnkey Test Software Solutions

- Includes LitePoint IQfact+ software solutions for customized testing of leading WLAN / Bluetooth chipsets
- Library of hundreds of chipset specific test solutions



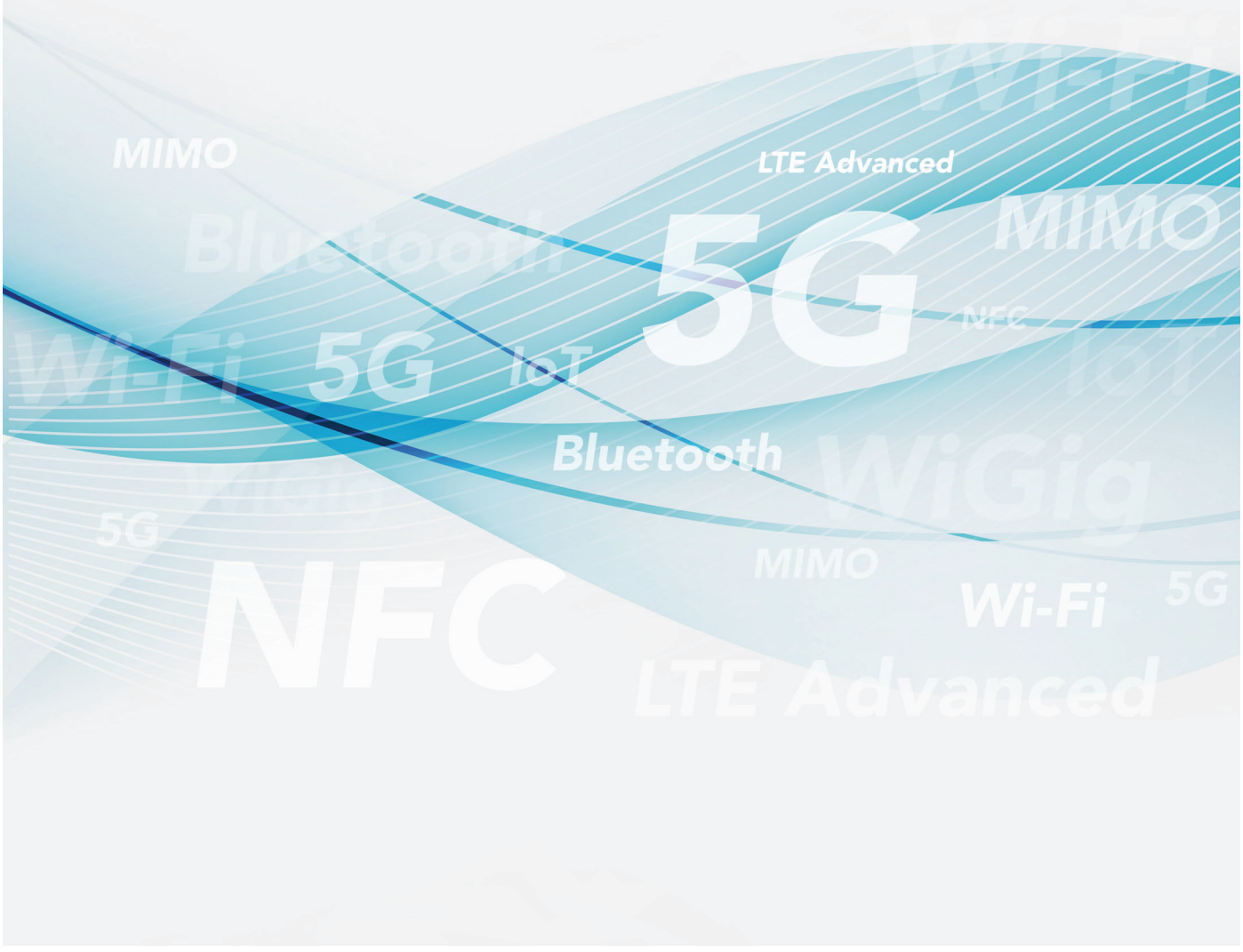
Supported Wireless Standards

- 802.11a/b/g/n/p/j
- 802.11ac/ax (optional)
- 802.11ah/af (optional)
- Bluetooth 1.x, 2.x, 3.0, 4.x, 5 (optional)
- DECT (optional)
- ZigBee/Z-Wave/WiSUN/IEEE 802.15.4 (optional)
- TD-LTE (optional)

iQxel-M16W

TECHNICAL SPECIFICATIONS

IQxel-M16W™
Multi-DUT Connectivity Test System



LITEPOINT

General Technical Specifications

RF Analyzer

Parameter	Ports (A/B/C/D)	Value	
Input frequency range	RF1 to RF4	400 to 6000 MHz	
IF bandwidth	RF1 to RF4	160 MHz	
Input power range	RF1 to RF4	+30 dBm peak (+25 dBm average)	
Input power accuracy	RF1 to RF4	Specification:	± 0.75 dB (+25 to -75 dBm)
		Typical:	± 0.50 dB (+25 to -75 dBm)
Input return loss	RF1 to RF4	>12 dB (400 to 6000 MHz)	
Spurious (signal applied)[1]	RF1 to RF4	< -60 dBc (CW, for signal levels greater than -20 dBm)	
Spectral flatness	RF1 to RF4	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.50 dB (± 80 MHz)
Inherent spurious floor (no signal)	RF1 to RF4	≤ -80 dBm	
Noise figure		≤ 30 dB at minimum input attenuation	
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		≥ 55 dB 100 kHz RBW	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	
Waveform capture duration		at 10 MHz sampling data rate	9600 ms
		at 20 MHz sampling data rate	4800 ms
		at 40 MHz sampling data rate	2400 ms
		at 80 MHz sampling data rate	1200 ms
		at 160 MHz sampling data rate	600 ms
		at 240 MHz sampling data rate	400 ms

RF Analyzer – Signal Trigger

Parameter	Range	
Absolute minimum value	Wideband RF	-30 dBm
	Video	-40 dBm
Absolute maximum value	Limited by the maximum input power	
Trigger relative threshold	30 dB	
Level accuracy	< ± 2 dB	

1 Excludes image rejection

RF Generator

Parameter	Ports (A/B/C/D)	Value	
Output frequency range	RF1 to RF4	400 to 6000 MHz	
IF bandwidth	RF1 to RF4	160 MHz	
Output power range (CW)	RF1 to RF4 (through path)	1 port active: 0 to -95 dBm (400 to 6000 MHz) All ports active: -5 to -95 dBm (≤ 4900 MHz) -15 to -95 dBm (> 4900 MHz)	
Output power range (CW)	RF1 to RF4 (combined path for Beamforming calibration)	1 port active: -10 to -95 dBm (≤ 4900 MHz) -20 to -95 dBm (>4900 MHz) All ports active: -15 to -95 dBm (≤ 4900 MHz) -25 to -95 dBm (> 4900 MHz)	
Output power accuracy	RF1 to RF4 (1 port active)	Specification:	± 0.75 dB (0 to -95 dBm)
		Typical:	± 0.50 dB (0 to -95 dBm)
Output return loss	RF1 to RF4	>12 dB (400 to 6000 MHz)	
Spurious (in channel)	RF1 to RF4	Specification:	≤ -40 dBc (160 MHz, >-55 dBm) (CW)
		Typical:	≤ -50 dBc (160 MHz, >-55 dBm) (CW)
Spurious (out of channel)	RF1 to RF4	Out-of-band (>± 80 MHz from carrier):	≤ -40 dBc (CW, excluding harmonics distortions)
Spectral flatness	RF1 to RF4	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.5 dB (± 80 MHz)
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		Specification:	≥ 60 dB (100 KHz signal BW), power level -40 dBm
		Typical:	≥70 dB (100 KHz signal BW), power level -40 dBm
Carrier leakage		≤ -40 dBc (CW output) for P0 > -50 dBm	
Gap power		≤ -90 dBm/100 kHz	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	

Waveform playback duration		At 10 MHz sampling data rate	9600 ms
		At 20 MHz sampling data rate	4800 ms
		At 40 MHz sampling data rate	2400 ms
		At 80 MHz sampling data rate	1200 ms
		At 160 MHz sampling data rate	600 ms
		At 240 MHz sampling data rate	400 ms

Port Isolation

Measurement	Description
Port to Port Isolation	VSA-to-VSA (through path): 100 dB, <2500 MHz, typical 90 dB, >2500 MHz, typical VSG-to-VSG (through path): 90 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical VSG-to-VSA (through and combined path): 100 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical

Timebase

Measurement	Description
Oscillator type	OCXO
Frequency	10 MHz
Initial accuracy (25°C, after 60 minute warm-up)	< ± 0.05 ppm
Maximum aging	< ± 0.1 ppm per year
Temperature stability	< ±0.05 ppm over 0oC to 55°C range, referenced to 25°C
Warm-up time (to within ±0.1 ppm at 25°C)	> 30 minutes

Wireless LAN 802.11a/b/g/n/p/j/ah/af, 802.11ac (Wi-Fi 5), 802.11ax[1] (Wi-Fi 6) Measurement Specifications

Measurement	Description	Performance
EVM[2]	EVM averaged over payload based on standard requirements (Typical)	Residual loopback EVM (full packet channel estimation): ≤ -50.5 dB (-2 to -15 dBm) Residual loopback EVM (preamble only channel estimation): ≤ -47.5 dB (-2 to -15 dBm) Residual VSA EVM (preamble only channel estimation): ≤ -48 dB (+20 to -15 dBm) Note: - Measured at 5755 MHz - Averaged over 20 packets - 802.11ax waveform, 80 MHz
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
RMS power	All: average power of complete data capture (dBm)	
	No gap: average power over all symbols after removal of any gap between packets (dBm)	
Max avg power	Peak value of the amplitude as a moving average over 40 samples (dBm)	
I/Q amplitude error	I/Q amplitude imbalance (%) and approximate contribution to EVM (dB)	
I/Q phase error	I/Q phase imbalance (degrees) and approximate contribution to EVM (dB)	
Frequency error	Carrier frequency error (kHz)	VSA measurement error: ≤ ± 0.2 ppm calibrated
RMS phase noise	Integrated phase noise (degrees)	VSA integrated phase noise: < 0.3 degrees (100 Hz to 1 MHz)
PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ± 80 MHz	
Spectral mask	Transmit spectrum mask	Spectral mask view: ± 80 MHz
Spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11a/g OFDM signals only	VSA flatness over 160 MHz BW: ± 1 dB
Sidelobe analysis (spectral mask, LO leakage)	Center peak and peaks of 1st and 2nd upper/lower sidelobes (dB) 802.11b/g DSSS signals only	

1 802.11ax IEEE draft 1.2 support with firmware v1.7 or higher
2 Based on calibration ver 1.2.11, FW ver 1.9.1 or higher

CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	
Power on / power down ramp	On: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-on time from 10% to 90% Power-on time from 90% power level to start of packet (Not provided for 802.11a/g OFDM signals) Off: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-off time from 90% to 10% Power-off time from 90% power level to end of packet (Not provided for 802.11a/g OFDM signals)	
Eye diagram	I and Q channels versus time (802.11b/g DSSS signals only)	
PSDU data	Recovered binary data sequence, including the MAC header and Frame Check Sequence, if present	
Raw capture data	I and Q signals versus time	
General waveform analysis	DC offset, RMS level, minimum/ maximum amplitude, peak-to-peak amplitude, RMS I- and Q-channel levels	
CW frequency analysis	Frequency of CW tone	
Per User (RU) TX Quality Results	Per-user EVM and Power results (802.11ax only)	See EVM specifications
Trigger Frame analysis	Decoding of AP HE Trigger frame (PSDU) with EVM and Power results (802.11ax only)	See EVM specifications and VSA power accuracy
STA Carrier Frequency Offset	(CFO) Frequency offset in Hz of the STA based on the HE trigger frame from the STA device (802.11ax only)	
STA System Timing Offset	Time offset between the HE trigger frame and the STA response (802.11ax only)	

802.11ax (Wi-Fi 6) Waveform Generation

Feature	Specification
Uplink Single User OFDMA (SU-OFDMA) Downlink Single User OFDMA (SU-OFDMA) Uplink Multi User OFDMA (MU-OFDMA) Downlink Multi User OFDMA (MU-OFDMA) Multi-User MIMO + MU-OFDMA	Up to 160 MHz Configurable Guard Interval
Trigger Frame Waveform Generation with configurable power levels per RU, and user configurable fields	Up to 12 dB between users
Waveform Generation with DCM (Dual Carrier Modulation) and LDPC support	

MIMO System Performance

The additional specifications in the table below apply to the complete IQxel-M16W MIMO system.

Measurement		Range
VSA capture trigger accuracy		≤ ± 3.5 ns
VSA start trigger accuracy		≤ ± 3.5 ns

Bluetooth® (1.0, 2.0, 2.1, 3.0) Measurement Specifications

Measurement	Description	Performance
TX output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm) ± 0.50 dB (+20 to -75 dBm) typical
TX output spectrum	Transmit DUT power spectral density	
20 dB bandwidth	Bandwidth between the ± 20 dB down points of the modulation waveform	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
In-band emissions (Adjacent channel)	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation characteristics	Average and peak frequency deviation (Hz)	(For EVM better than -25 dB) VSA measurement error: ≤ ± 0.2 ppm calibrated
Carrier frequency tolerance	Carrier frequency offset (Hz)	
Carrier frequency drift	Carrier frequency change over the Bluetooth burst (Hz)	
Relative transmit power (EDR)	Average power of complete data capture (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Carrier frequency stability (EDR)	Frequency drift over the Bluetooth EDR burst duration (Hz)	
Receive sensitivity[1]	Receive sensitivity test using LitePoint or user-generated waveforms. Includes Dirty Packets.	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)

Maximum input signal level	Assuming single-ended BER measurement	
RMS EVM (EDR)	RMS EVM for Bluetooth EDR	Residual VSA EVM: ≤ -35 dB (+20 to -30 dBm) Residual VSG EVM: ≤ -35 dB (-10 to -70 dBm)
Peak EVM (EDR)	Peak EVM for Bluetooth EDR	

1 IQxel-M16W supports testing sensitivity with Dirty Packets

Bluetooth (4.0, 4.1, 4.2) Measurement Specifications

Measurement	Description	Performance
Output power at NOC[1]		VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Output power at EOC[1]		
In-band emissions at NOC[1]	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
In-band emissions at EOC[1]		
Modulation characteristics	Average and peak frequency deviation (Hz)	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier frequency offset and drift at NOC[1]	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz)	
Carrier frequency offset and drift at EOC[1]		
Receiver sensitivity at NOC[1,2]	Receive sensitivity test using LitePoint or user-generated waveforms	VSA power accuracy: ± 0.75 dB (+20 to -95 dBm)
Receiver sensitivity at EOC[1,2]		
C/I and receiver selectivity performance[3]		VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking performance[3]		
Intermodulation performance		
Maximum input signal level	Assuming single-ended BER measurement	VSG maximum output power: 0 to -95 dBm CW
PER report integrity	Verifies the DUT PER report mechanism	

1 NOC and EOC tests are the same except for the operating conditions which do not impact the test equipment requirements
2 External signal source required for these measurements (not LitePoint supplied)
3 IQxel-M16W provides the wanted signal only. No interfering signal is available

Bluetooth 5 Measurement Specifications

Bluetooth 5 introduced a couple of new test requirements:

Data Rate: New requirements for testing with 2 Mbps, 1 Mbps, 500 kbps, 125 kbps signal

Stable Modulation: Optional requirement for device to support smaller variation in the frequency deviation during modulation (modulation index between 0.495-0.505). This enhancement gives device stable and better range coverage and thus competitive advantage

IQxel-MW is capable of testing for these new requirements

Measurement	Description	Performance
In-band emissions	Spurious emission measured at ± 5 MHz of DUT TX frequency only. Tested at 1 Mbps, 2 Mbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation Characteristics	Average and peak frequency deviation (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier Frequency offset and drift	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	
Stable Modulation Characteristics	Tested at 1 Mbps, 2 Mbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Receiver Sensitivity	Receive sensitivity test using LitePoint or user-generated waveforms. Tested at 1 Mbps, 2 Mbps, 125 kbps	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)
Receiver Sensitivity – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	
Maximum Input signal level	Assuming single-ended BER measurement. Tested at 1 Mbps, 2 Mbps	VSG maximum output power: 0 to -95 dBm
Maximum Input signal level – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps	
C/I and Receiver Selectivity Performance	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking Performance	Tested at 1 Mbps, 2 Mbps	
Intermodulation Performance	Tested at 1 Mbps, 2 Mbps	
PER Report Integrity	Verifies the DUT PER report mechanism. Tested at 1 Mbps, 2 Mbps,500 kbps, 125 kbps	

ZigBee (802.15.4), Z-wave (ITU-T G.9959), Wi-SUN (MR-FSK IEEE 802.15.4g)

Measurement	Description	Performance
Output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power spectral density	Transmit DUT power spectral density	
Center Frequency Tolerance	Tx center frequency tolerance	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
EVM	Offset: compensate the I and Q offset in OQPSK Normal: no compensation applied	
Other modulation quality measurements	LO leakage, clock error, phase error, symbol clock error	
CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	

DECT (ETSI EN 300 176-1)

Measurement	Description	Performance
Power	Normal Transmit Power	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power vs. time	Power time template	
Frequency offset	Frequency offset	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Frequency drift	Frequency drift during packet transmission	
Frequency deviation	S field, B field, whole packet	

Navigation[1]

Measurement	Range
Test Capability	Carrier-to-noise ratio
Output frequency range	GPS: 1575.42 MHz (fixed)
	GPS: 1575.42 MHz (fixed) GLONASS: 1598 to 1606 MHz COMPASS: 1561.098 (+/- 2.046) MHz Galileo: 1559 to 1593 MHz
Number of simultaneous channels	1
Output power range[2]	-60 to -95 dBm
Level accuracy	± 0.75 dB

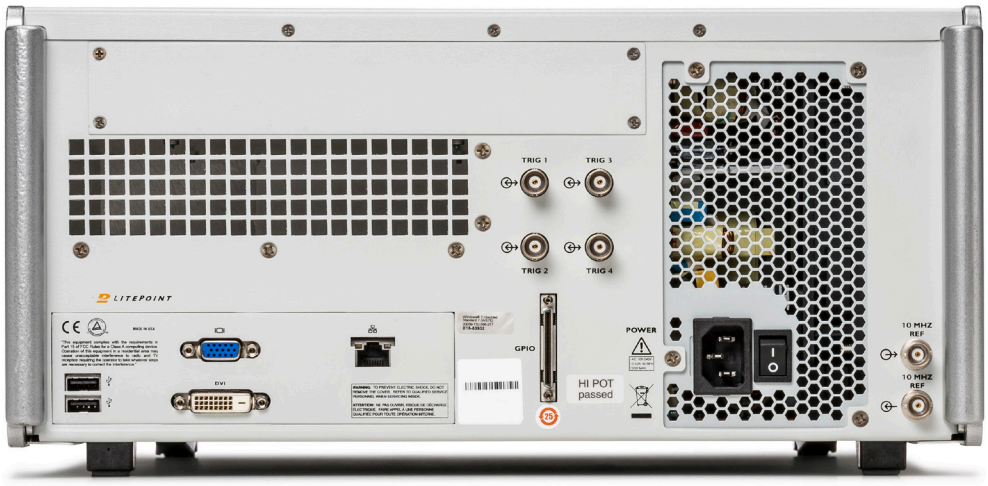
1 Navigation is a standard feature included with general purpose RF function
2 Require external attenuation for the power levels below -95 dBm

Port Descriptions

Front Panel

I/O	Function	Type
Power switch	Power on/off	Pushbutton switch
RF1A/RF1B/RF1C/RF1D	RF input/output	N female
RF2A/RF2B/RF2C/RF2D	RF input/output	N female
RF3A/RF3B/RF3C/RF3D	RF input/output	N female
RF4A/RF4B/RF4C/RF4D	RF input/output	N female
Power indicator	LED green – powered up, running LED orange – powered up, standby	LED indicator
Session active indicator	LED green – remote session active LED red – remote session lock	LED indicator
Status indicator	LED green – no faults/errors detected LED orange – Software error detected LED red – Hardware fault detected	LED indicator
RF port 1 A/B indicator	Indicates port input/output status	LED indicator
RF port 2 A/B indicator	Indicates port input/output status	LED indicator
RF port 3 A/B indicator	Indicates port input/output status	LED indicator
RF port 4 A/B indicator	Indicates port input/output status	LED indicator
RF port 1 C/D indicator	Indicates port input/output status	LED indicator
RF port 2 C/D indicator	Indicates port input/output status	LED indicator
RF port 3 C/D indicator	Indicates port input/output status	LED indicator
RF port 4 C/D indicator	Indicates port input/output status	LED indicator
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A

Rear Panel



General I/O

I/O	Function	Type
10 MHz ref input	10 MHz reference input the 10 MHz reference input has a 200 ohm impedance and accepts a sine wave ranging in amplitude from 0.3 Vpp to 4 Vpp.	BNC female
10 MHz ref output	10 MHz reference output	BNC female
Marker out / trigger in 1	TTL compatible	BNC female
Marker out / trigger in 2	TTL compatible	BNC female
Marker out / trigger in 3	TTL compatible	BNC female
Marker out / trigger In 4	TTL compatible	BNC female
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A
AC in	AC power input	100 to 240VAC (automatically switched) 50 to 60 Hz Includes hard power switch
DVI port	Display Litepoint monitor	DVI-D
VGA port	Display Litepoint monitor	VGA-15 pin
Communication I/O LAN	1000 Base-T LAN	RJ-45
GPIO	General purpose input/output	50-pin connector

General and Environmental

Dimensions	16.75" W x 7.4" H x 24" D (426 mm x 188 mm x 610 mm)
Weight	22.3 kg (49.2 pounds)
Power requirements	100 to 240 VAC, < 300 W, 50 to 60 Hz
Power consumption	<235 W (maximum), <10 W (standby)
Recommended PC	Intel Core i5 2.5 GHz with 4 GB of RAM or better
Recommended browser for optimal performance	Google Chrome R10 Release
Operating temperature	+10°C to +50°C (IEC EN60068-2-1, 2, 14)
Storage temperature	-20°C to +70°C (IEC EN60068-2-1, 2, 14)
Specification validity temperature[1]	+20°C to +35°C
Operating humidity	15% to 95% relative humidity, non-condensing (IEC EN60068-2-30)
EMC	EN 61326 Immunity for industrial environment, Class B emissions
Safety	IEC 61010-1, EN61010-1, UL3111-1, CAN/CSA-C22.2 No. 1010.1
Mechanical vibration	IEC 60068, IEC 61010 and MIL-T-28800D, class 5
Mechanical shock	ASTM D3332-99, Method B
Recommended calibration cycle	12 months
Warranty	12 months hardware 12 months software updates

1 Specifications valid over temperature range after invoking temperature compensation function.
For highest accuracy, recommend to enable temperature compensation if ambient temperature changes by more than 2°C.

Order Codes

Code	Product
0100-IXMW-003	IQxel-M16W Test System with 16 RF ports active.Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0100-IXMW-004	IQxel-M16W Test System with 8 RF ports active. Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0100-IXMW-007	IQxel-M16W Test System with 4 RF ports active. Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0300-IXMW-001	802.11ac VHT80 (80MHz signal bandwidth) software license
0300-IXMW-057	802.11ac VHT160 (80+80MHz and 160MHz signal bandwidth) software license (Requires 802.11ac VHT80 license)
0300-IXMW-069	802.11ax software license (Requires 802.11ac VHT80 license for 80MHz signal bandwidth or 802.11ac VHT160 license for 160MHz signal bandwidth)
0300-IXMW-061	WLAN MIMO software license. Enables MIMO option for 802.11n, 802.11ac, and 802.11ax (Requires associated 802.11 technology license)
0150-IXMW-003	WLAN MIMO kit. Includes MIMO software license and tester synchronization cables
0300-IXMW-003	Sequence Based Test (SBT) software license, also enables Trigger Based Test (TBT) for 802.11ax
0300-IXMW-089	WiFi Traffic Sniffer software license (Requires 802.11ax license)
0300-IXMW-002	Bluetooth measurement suite software license. Supports Bluetooth 1.0 - 4.x
0300-IXMW-071	Bluetooth 5 measurement suite software license (Requires Bluetooth 1.0 - 4.x license)
0300-IXMW-008	Zigbee measurement suite software license. Includes measurement capability for Zigbee, Wi-SUN and Z-wave
0300-IXMW-009	DECT measurement suite software license
0300-IXMW-044	802.11ah measurement suite software license
0300-IXMW-059	802.11af measurement suite software license
0300-IXMW-065	Sigfox measurement suite software license
0300-IXMW-055	LTE measurement suite software license

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LITEPOINT TECHNICAL SUPPORT
www.litepoint.com/support

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iQxel-M8W

TECHNICAL SPECIFICATIONS

IQxel-M8W™
Multi-DUT Connectivity Test System

LITEPOINT

General Technical Specifications

RF Analyzer

Parameter	Ports (A/B)	Value	
Input frequency range	RF1 to RF4	400 to 6000 MHz	
IF bandwidth	RF1 to RF4	160 MHz	
Input power range	RF1 to RF4	+30 dBm peak (+25 dBm average)	
Input power accuracy	RF1 to RF4	Specification:	± 0.75 dB (+25 to -75 dBm)
		Typical:	± 0.50 dB (+25 to -75 dBm)
Input return loss	RF1 to RF4	>12 dB (400 to 6000 MHz)	
Spurious (signal applied)[1]	RF1 to RF4	< -60 dBc (CW, for signal levels greater than -20 dBm)	
Spectral flatness	RF1 to RF4	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.50 dB (± 80 MHz)
Inherent spurious floor (no signal)	RF1 to RF4	≤ -80 dBm	
Noise figure		≤ 30 dB at minimum input attenuation	
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		≥ 55 dB 100 kHz RBW	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	
Waveform capture duration		at 10 MHz sampling data rate	9600 ms
		at 20 MHz sampling data rate	4800 ms
		at 40 MHz sampling data rate	2400 ms
		at 80 MHz sampling data rate	1200 ms
		at 160 MHz sampling data rate	600 ms
		at 240 MHz sampling data rate	400 ms

RF Analyzer – Signal Trigger

Parameter	Range	
Absolute minimum value	Wideband RF	-30 dBm
	Video	-40 dBm
Absolute maximum value	Limited by the maximum input power	
Trigger relative threshold	30 dB	
Level accuracy	< ± 2 dB	

1 Excludes image rejection

RF Generator

Parameter	Ports (A/B)	Value	
Output frequency range	RF1 to RF4	400 to 6000 MHz	
IF bandwidth	RF1 to RF4	160 MHz	
Output power range (CW)	RF1 to RF4 (through path)	1 port active: 0 to -95 dBm (400 to 6000 MHz) All ports active: -5 to -95 dBm (≤ 4900 MHz) -15 to -95 dBm (> 4900 MHz)	
Output power range (CW)	RF1 to RF4 (combined path for Beamforming calibration)	1 port active: -10 to -95 dBm (≤ 4900 MHz) -20 to -95 dBm (>4900 MHz) All ports active: -15 to -95 dBm (≤ 4900 MHz) -25 to -95 dBm (> 4900 MHz)	
Output power accuracy	RF1 to RF4 (1 port active)	Specification:	± 0.75 dB (0 to -95 dBm)
		Typical:	± 0.50 dB (0 to -95 dBm)
Output return loss	RF1 to RF4	>12 dB (400 to 6000 MHz)	
Spurious (in channel)	RF1 to RF4	Specification:	≤ -40 dBc (160 MHz, >-55 dBm) (CW)
		Typical:	≤ -50 dBc (160 MHz, >-55 dBm) (CW)
Spurious (out of channel)	RF1 to RF4	Out-of-band (>± 80 MHz from carrier):	≤ -40 dBc (CW, excluding harmonics distortions)
Spectral flatness	RF1 to RF4	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.5 dB (± 80 MHz)
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		Specification:	≥ 60 dB (100 KHz signal BW), power level -40 dBm
		Typical:	≥70 dB (100 KHz signal BW), power level -40 dBm
Carrier leakage		≤ -40 dBc (CW output) for P0 > -50 dBm	
Gap power		≤ -90 dBm/100 kHz	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	

Waveform playback duration		At 10 MHz sampling data rate	9600 ms
		At 20 MHz sampling data rate	4800 ms
		At 40 MHz sampling data rate	2400 ms
		At 80 MHz sampling data rate	1200 ms
		At 160 MHz sampling data rate	600 ms
		At 240 MHz sampling data rate	400 ms

Port Isolation

Measurement	Description
Port to Port Isolation	VSA-to-VSA (through path): 100 dB, <2500 MHz, typical 90 dB, >2500 MHz, typical VSG-to-VSG (through path): 90 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical VSG-to-VSA (through and combined path): 100 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical

Timebase

Measurement	Description
Oscillator type	OCXO
Frequency	10 MHz
Initial accuracy (25°C, after 60 minute warm-up)	< ± 0.05 ppm
Maximum aging	< ± 0.1 ppm per year
Temperature stability	< ±0.05 ppm over 0oC to 55°C range, referenced to 25°C
Warm-up time (to within ±0.1 ppm at 25°C)	> 30 minutes

Wireless LAN 802.11a/b/g/n/p/j/ah/af, 802.11ac (Wi-Fi 5), 802.11ax[1] (Wi-Fi 6) Measurement Specifications

Measurement	Description	Performance
EVM[2]	EVM averaged over payload based on standard requirements (Typical)	Residual loopback EVM (full packet channel estimation): ≤ -50.5 dB (-2 to -15 dBm) Residual loopback EVM (preamble only channel estimation): ≤ -47.5 dB (-2 to -15 dBm) Residual VSA EVM (preamble only channel estimation): ≤ -48 dB (+20 to -15 dBm) Note: - Measured at 5755 MHz - Averaged over 20 packets - 802.11ax waveform, 80 MHz
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
RMS power	All: average power of complete data capture (dBm)	
	No gap: average power over all symbols after removal of any gap between packets (dBm)	
Max avg power	Peak value of the amplitude as a moving average over 40 samples (dBm)	
I/Q amplitude error	I/Q amplitude imbalance (%) and approximate contribution to EVM (dB)	
I/Q phase error	I/Q phase imbalance (degrees) and approximate contribution to EVM (dB)	
Frequency error	Carrier frequency error (kHz)	VSA measurement error: ≤ ± 0.2 ppm calibrated
RMS phase noise	Integrated phase noise (degrees)	VSA integrated phase noise: < 0.3 degrees (100 Hz to 1 MHz)
PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ± 80 MHz	
Spectral mask	Transmit spectrum mask	Spectral mask view: ± 80 MHz
Spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11a/g OFDM signals only	VSA flatness over 160 MHz BW: ± 1 dB
Sidelobe analysis (spectral mask, LO leakage)	Center peak and peaks of 1st and 2nd upper/lower sidelobes (dB) 802.11b/g DSSS signals only	

1 802.11ax IEEE draft 1.2 support with firmware v1.7 or higher
2 Based on calibration ver 1.2.11, FW ver 1.9.1 or higher

CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	
Power on / power down ramp	On: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-on time from 10% to 90% Power-on time from 90% power level to start of packet (Not provided for 802.11a/g OFDM signals) Off: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-off time from 90% to 10% Power-off time from 90% power level to end of packet (Not provided for 802.11a/g OFDM signals)	
Eye diagram	I and Q channels versus time (802.11b/g DSSS signals only)	
PSDU data	Recovered binary data sequence, including the MAC header and Frame Check Sequence, if present	
Raw capture data	I and Q signals versus time	
General waveform analysis	DC offset, RMS level, minimum/ maximum amplitude, peak-to-peak amplitude, RMS I- and Q-channel levels	
CW frequency analysis	Frequency of CW tone	
Per User (RU) TX Quality Results	Per-user EVM and Power results (802.11ax only)	See EVM specifications
Trigger Frame analysis	Decoding of AP HE Trigger frame (PSDU) with EVM and Power results (802.11ax only)	See EVM specifications and VSA power accuracy
STA Carrier Frequency Offset	(CFO) Frequency offset in Hz of the STA based on the HE trigger frame from the STA device (802.11ax only)	
STA System Timing Offset	Time offset between the HE trigger frame and the STA response (802.11ax only)	

802.11ax (Wi-Fi 6) Waveform Generation

Feature	Specification
Uplink Single User OFDMA (SU-OFDMA) Downlink Single User OFDMA (SU-OFDMA) Uplink Multi User OFDMA (MU-OFDMA) Downlink Multi User OFDMA (MU-OFDMA) Multi-User MIMO + MU-OFDMA	Up to 160 MHz Configurable Guard Interval
Trigger Frame Waveform Generation with configurable power levels per RU, and user configurable fields	Up to 12 dB between users
Waveform Generation with DCM (Dual Carrier Modulation) and LDPC support	

MIMO System Performance

The additional specifications in the table below apply to the complete IQxel-M8W MIMO system.

Measurement		Range
VSA capture trigger accuracy		≤ ± 3.5 ns
VSA start trigger accuracy		≤ ± 3.5 ns

Bluetooth® (1.0, 2.0, 2.1, 3.0) Measurement Specifications

Measurement	Description	Performance
TX output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm) ± 0.50 dB (+20 to -75 dBm) typical
TX output spectrum	Transmit DUT power spectral density	
20 dB bandwidth	Bandwidth between the ± 20 dB down points of the modulation waveform	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
In-band emissions (Adjacent channel)	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation characteristics	Average and peak frequency deviation (Hz)	(For EVM better than -25 dB) VSA measurement error: ≤ ± 0.2 ppm calibrated
Carrier frequency tolerance	Carrier frequency offset (Hz)	
Carrier frequency drift	Carrier frequency change over the Bluetooth burst (Hz)	
Relative transmit power (EDR)	Average power of complete data capture (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Carrier frequency stability (EDR)	Frequency drift over the Bluetooth EDR burst duration (Hz)	

Receive sensitivity[1]	Receive sensitivity test using LitePoint or user-generated waveforms. Includes Dirty Packets.	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)
Maximum input signal level	Assuming single-ended BER measurement	
RMS EVM (EDR)	RMS EVM for Bluetooth EDR	Residual VSA EVM: ≤ -35 dB (+20 to -30 dBm) Residual VSG EVM: ≤ -35 dB (-10 to -70 dBm)
Peak EVM (EDR)	Peak EVM for Bluetooth EDR	

1 IQxel-M8W supports testing sensitivity with Dirty Packets

Bluetooth (4.0, 4.1, 4.2) Measurement Specifications

Measurement	Description	Performance
Output power at NOC[1]		VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Output power at EOC[1]		
In-band emissions at NOC[1]	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
In-band emissions at EOC[1]		
Modulation characteristics	Average and peak frequency deviation (Hz)	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier frequency offset and drift at NOC[1]	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz)	
Carrier frequency offset and drift at EOC[1]		
Receiver sensitivity at NOC[1,2]	Receive sensitivity test using LitePoint or user-generated waveforms	VSA power accuracy: ± 0.75 dB (+20 to -95 dBm)
Receiver sensitivity at EOC[1,2]		
C/I and receiver selectivity performance[3]		VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking performance[3]		
Intermodulation performance		
Maximum input signal level	Assuming single-ended BER measurement	VSG maximum output power: 0 to -95 dBm CW
PER report integrity	Verifies the DUT PER report mechanism	

1 NOC and EOC tests are the same except for the operating conditions which do not impact the test equipment requirements
2 External signal source required for these measurements (not LitePoint supplied)
3 IQxel-M8W provides the wanted signal only. No interfering signal is available

Bluetooth 5 Measurement Specifications

Bluetooth 5 introduced a couple of new test requirements:

Data Rate: New requirements for testing with 2 Mbps, 1 Mbps, 500 kbps, 125 kbps signal

Stable Modulation: Optional requirement for device to support smaller variation in the frequency deviation during modulation (modulation index between 0.495-0.505). This enhancement gives device stable and better range coverage and thus competitive advantage

IQxel-MW is capable of testing for these new requirements

Measurement	Description	Performance
In-band emissions	Spurious emission measured at ± 5 MHz of DUT TX frequency only. Tested at 1 Mbps, 2 Mbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation Characteristics	Average and peak frequency deviation (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier Frequency offset and drift	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	
Stable Modulation Characteristics	Tested at 1 Mbps, 2 Mbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Receiver Sensitivity	Receive sensitivity test using LitePoint or user-generated waveforms. Tested at 1 Mbps, 2 Mbps, 125 kbps	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)
Receiver Sensitivity – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	
Maximum Input signal level	Assuming single-ended BER measurement. Tested at 1 Mbps, 2 Mbps	VSG maximum output power: 0 to -95 dBm
Maximum Input signal level – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps	
C/I and Receiver Selectivity Performance	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking Performance	Tested at 1 Mbps, 2 Mbps	
Intermodulation Performance	Tested at 1 Mbps, 2 Mbps	
PER Report Integrity	Verifies the DUT PER report mechanism. Tested at 1 Mbps, 2 Mbps,500 kbps, 125 kbps	

ZigBee (802.15.4), Z-wave (ITU-T G.9959), Wi-SUN (MR-FSK IEEE 802.15.4g)

Measurement	Description	Performance
Output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power spectral density	Transmit DUT power spectral density	
Center Frequency Tolerance	Tx center frequency tolerance	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
EVM	Offset: compensate the I and Q offset in OQPSK Normal: no compensation applied	
Other modulation quality measurements	LO leakage, clock error, phase error, symbol clock error	
CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	

DECT (ETSI EN 300 176-1)

Measurement	Description	Performance
Power	Normal Transmit Power	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power vs. time	Power time template	
Frequency offset	Frequency offset	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Frequency drift	Frequency drift during packet transmission	
Frequency deviation	S field, B field, whole packet	

Navigation[1]

Measurement	Range
Test Capability	Carrier-to-noise ratio
Output frequency range	GPS: 1575.42 MHz (fixed) GLONASS: 1598 to 1606 MHz COMPASS: 1561.098 (+/- 2.046) MHz Galileo: 1559 to 1593 MHz
Number of simultaneous channels	1
Output power range[2]	-60 to -95 dBm
Level accuracy	± 0.75 dB

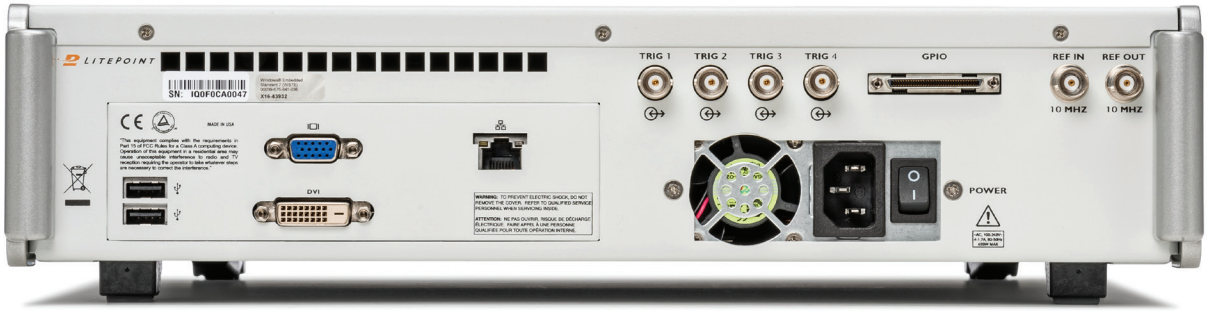
1 Navigation is a standard feature included with general purpose RF function
2 Require external attenuation for the power levels below -95 dBm

Port Descriptions

Front Panel

I/O	Function	Type
Power switch	Power on/off	Pushbutton switch
RF1A/RF1B	RF input/output	N female
RF2A/RF2B	RF input/output	N female
RF3A/RF3B	RF input/output	N female
RF4A/RF4B	RF input/output	N female
Power indicator	LED green – powered up, running LED orange – powered up, standby	LED indicator
Session active indicator	LED green – remote session active LED red – remote session lock	LED indicator
Status indicator	LED green – no faults/errors detected LED orange – Software error detected LED red – Hardware fault detected	LED indicator
RF port 1 A/B indicator	Indicates port input/output status	LED indicator
RF port 2 A/B indicator	Indicates port input/output status	LED indicator
RF port 3 A/B indicator	Indicates port input/output status	LED indicator
RF port 4 A/B indicator	Indicates port input/output status	LED indicator
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A

Rear Panel



General I/O

I/O	Function	Type
10 MHz ref input	10 MHz reference input the 10 MHz reference input has a 200 ohm impedance and accepts a sine wave ranging in amplitude from 0.3 Vpp to 4 Vpp.	BNC female
10 MHz ref output	10 MHz reference output	BNC female
Marker out / trigger in 1	TTL compatible	BNC female
Marker out / trigger in 2	TTL compatible	BNC female
Marker out / trigger in 3	TTL compatible	BNC female
Marker out / trigger In 4	TTL compatible	BNC female
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A
AC in	AC power input	100 to 240VAC (automatically switched) 50 to 60 Hz Includes hard power switch
DVI port	Display Litepoint monitor	DVI-D
VGA port	Display Litepoint monitor	VGA-15 pin
Communication I/O LAN	1000 Base-T LAN	RJ-45
GPIO	General purpose input/output	50-pin connector

General and Environmental

Dimensions	14.5" W x 3.2" H x 20.5" D (368 mm x 82 mm x 521 mm)
Weight	11.4 kg (25.2 pounds)
Power requirements	100 to 240 VAC, < 300 W, 50 to 60 Hz
Power consumption	<235 W (maximum), <10 W (standby)
Recommended PC	Intel Core i5 2.5 GHz with 4 GB of RAM or better
Recommended browser for optimal performance	Google Chrome R10 Release
Operating temperature	+10°C to +50°C (IEC EN60068-2-1, 2, 14)
Storage temperature	-20°C to +70°C (IEC EN60068-2-1, 2, 14)
Specification validity temperature[1]	+20°C to +35°C
Operating humidity	15% to 95% relative humidity, non-condensing (IEC EN60068-2-30)
EMC	EN 61326 Immunity for industrial environment, Class B emissions
Safety	IEC 61010-1, EN61010-1, UL3111-1, CAN/CSA-C22.2 No. 1010.1
Mechanical vibration	IEC 60068, IEC 61010 and MIL-T-28800D, class 5
Mechanical shock	ASTM D3332-99, Method B
Recommended calibration cycle	12 months
Warranty	12 months hardware 12 months software updates

1 Specifications valid over temperature range after invoking temperature compensation function.
For highest accuracy, recommend to enable temperature compensation if ambient temperature changes by more than 2°C.

Order Codes

Code	Product
0100-IXMW-001	IQxel-M8W Test System with 8 RF ports active. Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0100-IXMW-002	IQxel-M8W Test System with 4 RF ports active.Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0300-IXMW-001	802.11ac VHT80 (80MHz signal bandwidth) software license
0300-IXMW-057	802.11ac VHT160 (80+80MHz and 160MHz signal bandwidth) software license (Requires 802.11ac VHT80 license)
0300-IXMW-069	802.11ax software license (Requires 802.11ac VHT80 license for 80MHz signal bandwidth or 802.11ac VHT160 license for 160MHz signal bandwidth)
0300-IXMW-061	WLAN MIMO software license. Enables MIMO option for 802.11n, 802.11ac, and 802.11ax (Requires associated 802.11 technology license)
0150-IXMW-003	WLAN MIMO kit. Includes MIMO software license and tester synchronization cables
0300-IXMW-003	Sequence Based Test (SBT) software license, also enables Trigger Based Test (TBT) for 802.11ax
0300-IXMW-089	WiFi Traffic Sniffer software license (Requires 802.11ax license)
0300-IXMW-002	Bluetooth measurement suite software license. Supports Bluetooth 1.0 - 4.x
0300-IXMW-071	Bluetooth 5 measurement suite software license (Requires Bluetooth 1.0 - 4.x license)
0300-IXMW-008	Zigbee measurement suite software license. Includes measurement capability for Zigbee, Wi-SUN and Z-wave
0300-IXMW-009	DECT measurement suite software license
0300-IXMW-044	802.11ah measurement suite software license
0300-IXMW-059	802.11af measurement suite software license
0300-IXMW-065	Sigfox measurement suite software license
0300-IXMW-055	LTE measurement suite software license

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LITEPOINT TECHNICAL SUPPORT

www.litepoint.com/support

Doc: 1075-0104-001
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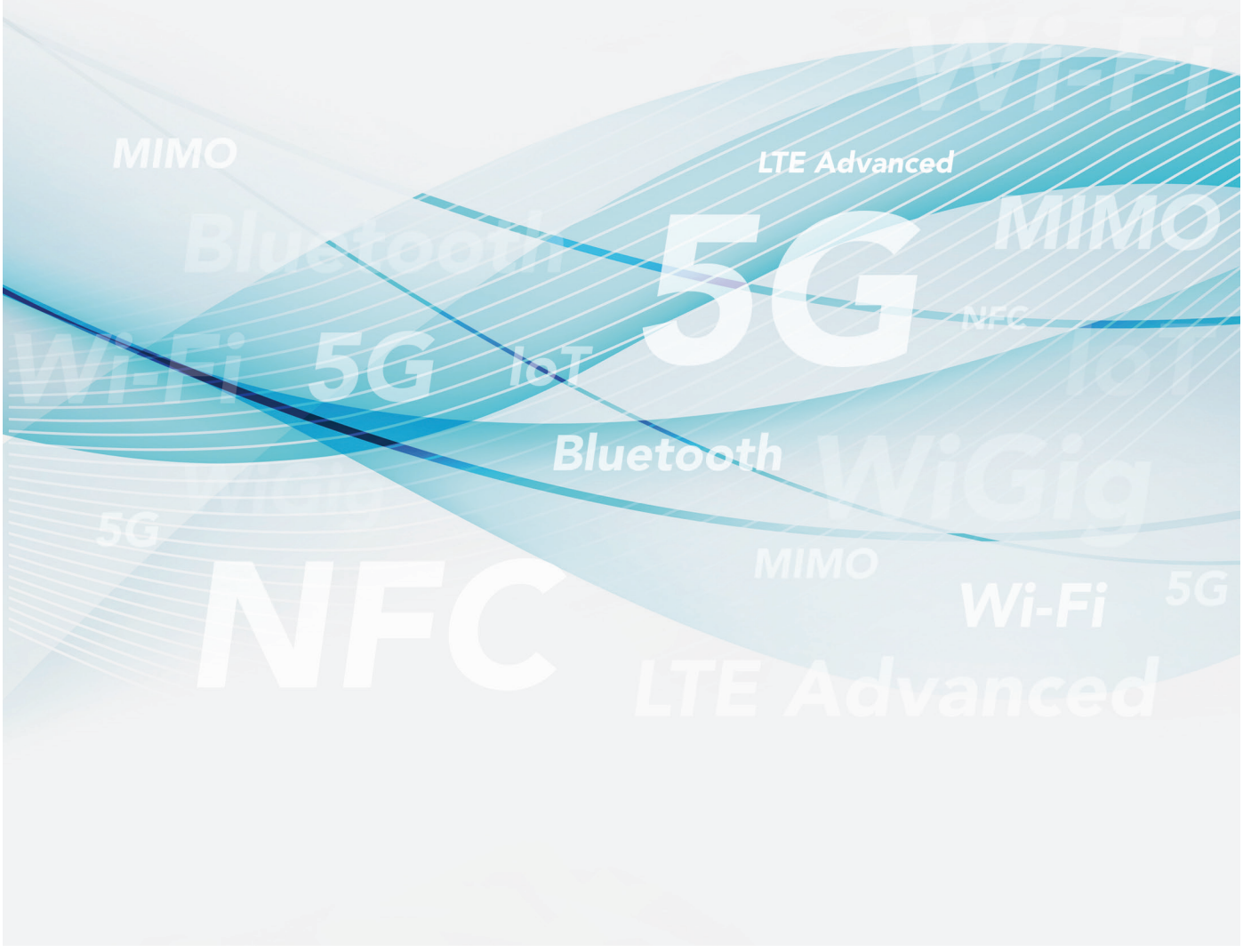
iQxel-M2W

TECHNICAL SPECIFICATIONS

IQxel-M2W™

R&D Connectivity Test System for Next Generation of Wi-Fi



LITEPOINT

General Technical Specifications

RF Analyzer

Parameter	Ports (A/B)	Value	
Input frequency range	RF1	400 to 6000 MHz	
IF bandwidth	RF1	160 MHz	
Input power range	RF1	+30 dBm peak (+25 dBm average)	
Input power accuracy	RF1	Specification:	± 0.75 dB (+25 to -75 dBm)
		Typical:	± 0.50 dB (+25 to -75 dBm)
Input return loss	RF1	>12 dB (400 to 6000 MHz)	
Spurious (signal applied)[1]	RF1	< -60 dBc (CW, for signal levels greater than -20 dBm)	
Spectral flatness	RF1	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.50 dB (± 80 MHz)
Inherent spurious floor (no signal)	RF1	≤ -80 dBm	
Noise figure		≤ 30 dB at minimum input attenuation	
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		≥ 55 dB 100 kHz RBW	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	
Waveform capture duration		at 10 MHz sampling data rate	9600 ms
		at 20 MHz sampling data rate	4800 ms
		at 40 MHz sampling data rate	2400 ms
		at 80 MHz sampling data rate	1200 ms
		at 160 MHz sampling data rate	600 ms
		at 240 MHz sampling data rate	400 ms

RF Analyzer – Signal Trigger

Parameter	Range	
Absolute minimum value	Wideband RF	-30 dBm
	Video	-40 dBm
Absolute maximum value	Limited by the maximum input power	
Trigger relative threshold	30 dB	
Level accuracy	< ± 2 dB	

1 Excludes image rejection

RF Generator

Parameter	Ports (A/B)	Value	
Output frequency range	RF1	400 to 6000 MHz	
IF bandwidth	RF1	160 MHz	
Output power range (CW)	RF1 (through path)	0 to -95 dBm (400 to 6000 MHz)	
Output power range (CW)	RF1 (combined path for Beamforming calibration)	-10 to -95 dBm (≤ 4900 MHz) -20 to -95 dBm (>4900 MHz)	
Output power accuracy	RF1 (1 port active)	Specification:	± 0.75 dB (0 to -95 dBm)
		Typical:	± 0.50 dB (0 to -95 dBm)
Output return loss	RF1	>12 dB (400 to 6000 MHz)	
Spurious (in channel)	RF1	Specification:	≤ -40 dBc (160 MHz, >-55 dBm) (CW)
		Typical:	≤ -50 dBc (160 MHz, >-55 dBm) (CW)
Spurious (out of channel)	RF1	Out-of-band (>± 80 MHz from carrier):	≤ -40 dBc (CW, excluding harmonics distortions)
Spectral flatness	RF1	Specification:	≤ ± 1 dB (± 80 MHz)
		Typical:	± 0.5 dB (± 80 MHz)
Integrated phase noise		≤ 0.3 degrees (100 Hz to 1 MHz) (400 to 6000 MHz) 0.2 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		Specification:	≥ 60 dB (100 KHz signal BW), power level -40 dBm
		Typical:	≥70 dB (100 KHz signal BW), power level -40 dBm
Carrier leakage		≤ -40 dBc (CW output) for P0 > -50 dBm	
Gap power		≤ -90 dBm/100 kHz	
Sampling data rate		10, 20, 40, 80, 160, 240 MHz	
Waveform playback duration		At 10 MHz sampling data rate	9600 ms
		At 20 MHz sampling data rate	4800 ms
		At 40 MHz sampling data rate	2400 ms
		At 80 MHz sampling data rate	1200 ms
		At 160 MHz sampling data rate	600 ms
		At 240 MHz sampling data rate	400 ms

Port Isolation

Measurement	Description
Port to Port Isolation	VSA-to-VSA (through path): 100 dB, <2500 MHz, typical 90 dB, >2500 MHz, typical VSG-to-VSG (through path): 90 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical VSG-to-VSA (through and combined path): 100 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical

Timebase

Measurement	Description
Oscillator type	OCXO
Frequency	10 MHz
Initial accuracy (25°C, after 60 minute warm-up)	< ± 0.05 ppm
Maximum aging	< ± 0.1 ppm per year
Temperature stability	< ±0.05 ppm over 0oC to 55°C range, referenced to 25°C
Warm-up time (to within ±0.1 ppm at 25°C)	> 30 minutes

Wireless LAN 802.11a/b/g/n/p/j/ah/af, 802.11ac (Wi-Fi 5), 802.11ax[1] (Wi-Fi 6) Measurement Specifications

Measurement	Description	Performance
EVM[2]	EVM averaged over payload based on standard requirements (Typical)	Residual VSA EVM (full packet channel estimation): ≤ -50 dB (+20 to -10 dBm) ≤ -48 dB (-10 to -20 dBm) Residual VSG EVM: (full packet channel estimation): ≤ -48 dB (-2 to -35 dBm) Residual VSA EVM (preamble only channel estimation): ≤ -48 dB (+20 to -10 dBm) ≤ -45 dB (-10 to -20 dBm) Residual VSG EVM: (preamble only channel estimation): ≤ -45 dB (-2 to -35 dBm) Note: - Measured at 5755 MHz - Averaged over 20 packets - 802.11ax waveform, 80 MHz
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
RMS power	All: average power of complete data capture (dBm)	
	No gap: average power over all symbols after removal of any gap between packets (dBm)	
Max avg power	Peak value of the amplitude as a moving average over 40 samples (dBm)	
I/Q amplitude error	I/Q amplitude imbalance (%) and approximate contribution to EVM (dB)	
I/Q phase error	I/Q phase imbalance (degrees) and approximate contribution to EVM (dB)	
Frequency error	Carrier frequency error (kHz)	VSA measurement error: ≤ ± 0.2 ppm calibrated
RMS phase noise	Integrated phase noise (degrees)	VSA integrated phase noise: < 0.3 degrees (100 Hz to 1 MHz)
PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ± 80 MHz	
Spectral mask	Transmit spectrum mask	Spectral mask view: ± 80 MHz

1 802.11ax IEEE draft 1.2 support with firmware v1.7 or higher
2 Based on calibration ver 1.2.11, FW ver 1.9.1 or higher

Spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11a/g OFDM signals only	VSA flatness over 160 MHz BW: ± 1 dB
Sidelobe analysis (spectral mask, LO leakage)	Center peak and peaks of 1st and 2nd upper/lower sidelobes (dB) 802.11b/g DSSS signals only	
CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	
Power on / power down ramp	On: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-on time from 10% to 90% Power-on time from 90% power level to start of packet (Not provided for 802.11a/g OFDM signals) Off: relative power level (% of average) versus time (802.11b/g CCK signals only) Power-off time from 90% to 10% Power-off time from 90% power level to end of packet (Not provided for 802.11a/g OFDM signals)	
Eye diagram	I and Q channels versus time (802.11b/g DSSS signals only)	
PSDU data	Recovered binary data sequence, including the MAC header and Frame Check Sequence, if present	
Raw capture data	I and Q signals versus time	
General waveform analysis	DC offset, RMS level, minimum/ maximum amplitude, peak-to-peak amplitude, RMS I- and Q-channel levels	
CW frequency analysis	Frequency of CW tone	
Per User (RU) TX Quality Results	Per-user EVM and Power results (802.11ax only)	See EVM specifications
Trigger Frame analysis	Decoding of AP HE Trigger frame (PSDU) with EVM and Power results (802.11ax only)	See EVM specifications and VSA power accuracy
STA Carrier Frequency Offset	(CFO) Frequency offset in Hz of the STA based on the HE trigger frame from the STA device (802.11ax only)	
STA System Timing Offset	Time offset between the HE trigger frame and the STA response (802.11ax only)	

802.11ax (Wi-Fi 6) Waveform Generation

Feature	Specification
Uplink Single User OFDMA (SU-OFDMA) Downlink Single User OFDMA (SU-OFDMA) Uplink Multi User OFDMA (MU-OFDMA) Downlink Multi User OFDMA (MU-OFDMA) Multi-User MIMO + MU-OFDMA	Up to 160 MHz Configurable Guard Interval
Trigger Frame Waveform Generation with configurable power levels per RU, and user configurable fields	Up to 12 dB between users
Waveform Generation with DCM (Dual Carrier Modulation) and LDPC support	

MIMO System Performance

The additional specifications in the table below apply to the complete IQxel-M2W MIMO system.

Measurement		Range
VSA capture trigger accuracy		≤ ± 3.5 ns
VSA start trigger accuracy		≤ ± 3.5 ns

Bluetooth® (1.0, 2.0, 2.1, 3.0) Measurement Specifications

Measurement	Description	Performance
TX output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm) ± 0.50 dB (+20 to -75 dBm) typical
TX output spectrum	Transmit DUT power spectral density	
20 dB bandwidth	Bandwidth between the ± 20 dB down points of the modulation waveform	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
In-band emissions (Adjacent channel)	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation characteristics	Average and peak frequency deviation (Hz)	(For EVM better than -25 dB) VSA measurement error: ≤ ± 0.2 ppm calibrated
Carrier frequency tolerance	Carrier frequency offset (Hz)	
Carrier frequency drift	Carrier frequency change over the Bluetooth burst (Hz)	
Relative transmit power (EDR)	Average power of complete data capture (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Carrier frequency stability (EDR)	Frequency drift over the Bluetooth EDR burst duration (Hz)	

Receive sensitivity[1]	Receive sensitivity test using LitePoint or user-generated waveforms. Includes Dirty Packets.	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)
Maximum input signal level	Assuming single-ended BER measurement	
RMS EVM (EDR)	RMS EVM for Bluetooth EDR	Residual VSA EVM: ≤ -35 dB (+20 to -30 dBm) Residual VSG EVM: ≤ -35 dB (-10 to -70 dBm)
Peak EVM (EDR)	Peak EVM for Bluetooth EDR	

1 IQxel-M2W supports testing sensitivity with Dirty Packets

Bluetooth (4.0, 4.1, 4.2) Measurement Specifications

Measurement	Description	Performance
Output power at NOC[1]		VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Output power at EOC[1]		
In-band emissions at NOC[1]	Spurious emission measured at ± 5 MHz of DUT TX frequency only	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
In-band emissions at EOC[1]		
Modulation characteristics	Average and peak frequency deviation (Hz)	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier frequency offset and drift at NOC[1]	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz)	
Carrier frequency offset and drift at EOC[1]		
Receiver sensitivity at NOC[1,2]	Receive sensitivity test using LitePoint or user-generated waveforms	VSA power accuracy: ± 0.75 dB (+20 to -95 dBm)
Receiver sensitivity at EOC[1,2]		
C/I and receiver selectivity performance[3]		VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking performance[3]		
Intermodulation performance		
Maximum input signal level	Assuming single-ended BER measurement	VSG maximum output power: 0 to -95 dBm CW
PER report integrity	Verifies the DUT PER report mechanism	

1 NOC and EOC tests are the same except for the operating conditions which do not impact the test equipment requirements
2 External signal source required for these measurements (not LitePoint supplied)
3 IQxel-M2W provides the wanted signal only. No interfering signal is available

Bluetooth 5 Measurement Specifications

Bluetooth 5 introduced a couple of new test requirements:

Data Rate: New requirements for testing with 2 Mbps, 1 Mbps, 500 kbps, 125 kbps signal

Stable Modulation: Optional requirement for device to support smaller variation in the frequency deviation during modulation (modulation index between 0.495-0.505). This enhancement gives device stable and better range coverage and thus competitive advantage

IQxel-MW is capable of testing for these new requirements

Measurement	Description	Performance
In-band emissions	Spurious emission measured at ± 5 MHz of DUT TX frequency only. Tested at 1 Mbps, 2 Mbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Modulation Characteristics	Average and peak frequency deviation (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Carrier Frequency offset and drift	Carrier frequency offset (Hz) and change over the Bluetooth burst (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps	
Stable Modulation Characteristics	Tested at 1 Mbps, 2 Mbps	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Receiver Sensitivity	Receive sensitivity test using LitePoint or user-generated waveforms. Tested at 1 Mbps, 2 Mbps, 125 kbps	VSG power accuracy: ± 0.75 dB (0 to -95 dBm)
Receiver Sensitivity – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	
Maximum Input signal level	Assuming single-ended BER measurement. Tested at 1 Mbps, 2 Mbps	VSG maximum output power: 0 to -95 dBm
Maximum Input signal level – Stable Modulation Index	Tested at 1 Mbps, 2 Mbps	
C/I and Receiver Selectivity Performance	Tested at 1 Mbps, 2 Mbps, 500 kbps, 125 kbps	VSA spurious: < -50 dBc (50 kHz RBW) (CW)
Blocking Performance	Tested at 1 Mbps, 2 Mbps	
Intermodulation Performance	Tested at 1 Mbps, 2 Mbps	
PER Report Integrity	Verifies the DUT PER report mechanism. Tested at 1 Mbps, 2 Mbps,500 kbps, 125 kbps	

ZigBee (802.15.4), Z-wave (ITU-T G.9959), Wi-SUN (MR-FSK IEEE 802.15.4g)

Measurement	Description	Performance
Output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power spectral density	Transmit DUT power spectral density	
Center Frequency Tolerance	Tx center frequency tolerance	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
EVM	Offset: compensate the I and Q offset in OQPSK Normal: no compensation applied	
Other modulation quality measurements	LO leakage, clock error, phase error, symbol clock error	
CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	

DECT (ETSI EN 300 176-1)

Measurement	Description	Performance
Power	Normal Transmit Power	VSA power accuracy: ± 0.75 dB (+20 to -75 dBm)
Power vs. time	Power time template	
Frequency offset	Frequency offset	VSA frequency accuracy: ≤ ± 0.2 ppm calibrated
Frequency drift	Frequency drift during packet transmission	
Frequency deviation	S field, B field, whole packet	

Navigation[1]

Measurement	Range
Test Capability	Carrier-to-noise ratio
Output frequency range	GPS: 1575.42 MHz (fixed)
	GPS: 1575.42 MHz (fixed) GLONASS: 1598 to 1606 MHz COMPASS: 1561.098 (+/- 2.046) MHz Galileo: 1559 to 1593 MHz
Number of simultaneous channels	1
Output power range[2]	-60 to -95 dBm
Level accuracy	± 0.75 dB

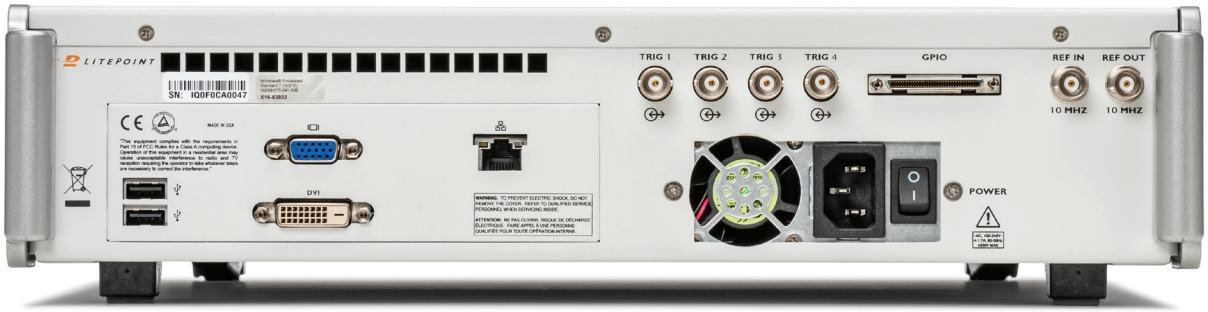
1 Navigation is a standard feature included with general purpose RF function
2 Require external attenuation for the power levels below -95 dBm

Port Descriptions

Front Panel

I/O	Function	Type
Power switch	Power on/off	Pushbutton switch
RF1A/RF1B	RF input/output	N female
Power indicator	LED green – powered up, running LED orange – powered up, standby	LED indicator
Session active indicator	LED green – remote session active LED red – remote session lock	LED indicator
Status indicator	LED green – no faults/errors detected LED orange – Software error detected LED red – Hardware fault detected	LED indicator
RF port 1 A/B indicator	Indicates port input/output status	LED indicator
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A

Rear Panel



General I/O

I/O	Function	Type
10 MHz ref input	10 MHz reference input the 10 MHz reference input has a 200 ohm impedance and accepts a sine wave ranging in amplitude from 0.3 Vpp to 4 Vpp.	BNC female
10 MHz ref output	10 MHz reference output	BNC female
Marker out / trigger in 1	TTL compatible	BNC female
Marker out / trigger in 2	TTL compatible	BNC female
Marker out / trigger in 3	TTL compatible	BNC female
Marker out / trigger In 4	TTL compatible	BNC female
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A
AC in	AC power input	100 to 240VAC (automatically switched) 50 to 60 Hz Includes hard power switch
DVI port	Display Litepoint monitor	DVI-D
VGA port	Display Litepoint monitor	VGA-15 pin
Communication I/O LAN	1000 Base-T LAN	RJ-45
GPIO	General purpose input/output	50-pin connector

General and Environmental

Dimensions	14.5" W x 3.2" H x 20.5" D (368 mm x 82 mm x 521 mm)
Weight	11.4 kg (25.2 pounds)
Power requirements	100 to 240 VAC, < 300 W, 50 to 60 Hz
Power consumption	<235 W (maximum), <10 W (standby)
Recommended PC	Intel Core i5 2.5 GHz with 4 GB of RAM or better
Recommended browser for optimal performance	Google Chrome R10 Release
Operating temperature	+10°C to +50°C (IEC EN60068-2-1, 2, 14)
Storage temperature	-20°C to +70°C (IEC EN60068-2-1, 2, 14)
Specification validity temperature[1]	+20°C to +35°C
Operating humidity	15% to 95% relative humidity, non-condensing (IEC EN60068-2-30)
EMC	EN 61326 Immunity for industrial environment, Class B emissions
Safety	IEC 61010-1, EN61010-1, UL3111-1, CAN/CSA-C22.2 No. 1010.1
Mechanical vibration	IEC 60068, IEC 61010 and MIL-T-28800D, class 5
Mechanical shock	ASTM D3332-99, Method B
Recommended calibration cycle	12 months
Warranty	12 months hardware 12 months software updates

1 Specifications valid over temperature range after invoking temperature compensation function.
For highest accuracy, recommend to enable temperature compensation if ambient temperature changes by more than 2°C.

Order Codes

Code	Product
0100-IXMW-006	IQxel-M2W Test System. Includes WLAN measurement suite software for SISO 802.11a/b/g/n/j/p
0300-IXMW-001	802.11ac VHT80 (80MHz signal bandwidth) software license
0300-IXMW-057	802.11ac VHT160 (80+80MHz and 160MHz signal bandwidth) software license (Requires 802.11ac VHT80 license)
0300-IXMW-069	802.11ax software license (Requires 802.11ac VHT80 license for 80MHz signal bandwidth or 802.11ac VHT160 license for 160MHz signal bandwidth)
0300-IXMW-061	WLAN MIMO software license. Enables MIMO option for 802.11n, 802.11ac, and 802.11ax (Requires associated 802.11 technology license)
0150-IXMW-003	WLAN MIMO kit. Includes MIMO software license and tester synchronization cables
0300-IXMW-003	Sequence Based Test (SBT) software license, also enables Trigger Based Test (TBT) for 802.11ax
0300-IXMW-089	WiFi Traffic Sniffer software license (Requires 802.11ax license)
0300-IXMW-002	Bluetooth measurement suite software license. Supports Bluetooth 1.0 - 4.x
0300-IXMW-071	Bluetooth 5 measurement suite software license (Requires Bluetooth 1.0 - 4.x license)
0300-IXMW-008	Zigbee measurement suite software license. Includes measurement capability for Zigbee, Wi-SUN and Z-wave
0300-IXMW-009	DECT measurement suite software license
0300-IXMW-044	802.11ah measurement suite software license
0300-IXMW-059	802.11af measurement suite software license
0300-IXMW-065	Sigfox measurement suite software license
0300-IXMW-055	LTE measurement suite software license