

IQxel™ Next Generation Connectivity Test System



General Technical Specifications

RF Analyzer

Parameter	Ports	Value	
Input frequency range	RF1, RF2	2200 to 2600 MHz 4900 to 6000 MHz	
IF bandwidth	RF1, RF2	IQxel80	120 MHz
		IQxel160	(120 + 120) MHz
Max input power	RF1, RF2	+30 dBm peak +20 dBm average	
Input power accuracy	RF1, RF2	Specification:	± 0.75 dB (+20 to -75 dBm)
		Typical:	± 0.50 dB (+20 to -75 dBm)
Quantization		16 bits	
Input return loss	RF1, RF2	> 12 dB (2200 to 2600 MHz)	
		> 12 dB (4900 to 6000 MHz)	
Spurious	RF1, RF2	< -55 dBc (50 kHz RBW) (CW)	
Spectral flatness	RF1, RF2	Specification:	$\leq \pm 0.50$ dB (+/- 40 MHz)
		Typical:	± 0.25 dB (+/- 40 MHz)
Inherent spurious floor	RF1, RF2	≤ -90 dBm (2200 to 2600 MHz)	
		≤ -90 dBm (4900 to 6000 MHz)	
Noise figure		≤ 30 dB at minimum input attenuation	
Integrated phase noise		< 0.5 degrees (100 Hz to 1 MHz) (2200 to 2600 MHz)	
		< 0.5 degrees (100 Hz to 1 MHz) (4900 to 6000 MHz)	
		0.3 degrees (100 Hz to 1 MHz) typical	
Signal to noise ratio		≥ 55 dB 100 kHz RBW	
Sampling data rate		40, 80, 160 MHz	
Waveform capture duration		at 40 MHz sampling data rate	320 ms
		at 80 MHz sampling data rate	160 ms
		at 160 MHz sampling data rate	80 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	

Baseband Analyzer

Parameter	Port Designations	Range
Output power range	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	2 V peak-to-peak
Common mode voltage	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	0 V (DC coupled)
Impedance	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	50 Ω (100 Ω differential)

RF Generator

Parameter	Ports	Range	
Output frequency range	RF1, RF2	2200 to 2600 MHz 4900 to 6000 MHz	
IF bandwidth	RF1, RF2	IQxel80	120 MHz
		IQxel160	(120 + 120) MHz
		CW:	+9 to -95 dBm (2200 to 2600 MHz), P1dB +7 to -95 dBm (4900 to 6000 MHz), P1dB
Output power accuracy		Specification:	± 0.75 dB (0 to -95 dBm)
		Typical:	± 0.50 dB (0 to -95 dBm)
Quantization		16 bits	
Output return loss	RF1, RF2	> 12 dB (2200 to 2600 MHz) > 12 dB (4900 to 6000 MHz)	
Spurious (in channel)	RF1, RF2	Specification:	≤ -50 dBc or ≤ -95 dBm (80 MHz)
Spurious (out of channel)	RF1, RF2	Out-of-band ($> \pm 40$ MHz from carrier):	≤ -45 dBc
Spectral flatness	RF1, RF2	Specification:	$\leq \pm 0.50$ dB (+/- 40 MHz)
		Typical:	± 0.25 dB (+/- 40 MHz)
Integrated phase noise		< 0.5 degrees (100 Hz – 1 MHz) (2200 to 2600 MHz) < 0.5 degrees (100 Hz – 1 MHz) (4900 to 6000 MHz) 0.3 degrees (100 Hz – 1 MHz) typical	
Signal to noise ratio		Specification:	≥ 60 dB 100 kHz RBW, minimum attenuation, power level = -45 dBm
		Typical:	≥ 70 dB (100 kHz RBW), power level = -45 dBm
Carrier leakage		≤ -45 dBc (CW output) ≤ -90 dBm (between packets, when enhanced gap rejection enabled)	
Gap power		≤ -90 dBm/100kHz	

Sampling data rate		40, 80, 160	
Waveform capture duration		At 40 MHz sampling data rate	320 ms
		At 80 MHz sampling data rate	160 ms
		At 160 MHz sampling data rate	80 ms

Baseband Generator

Parameter	Port Designations	Range
Output power range	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	2 V peak-to-peak
Common mode voltage	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	0 V (DC coupled)
Impedance	BBG_I+, BBG_I- BBG_Q+, BBG_Q-	50 Ω (100 Ω differential)

Port Isolation

VSA to VSG isolation	Typical < -80 dB
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Timebase

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 0°C to 50°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/ac) Measurement Specifications

Measurement	Description	Performance	
EVM	EVM averaged over payload based on standard requirements	<p>(Averaged over 20 packets, 16 data OFDM symbols long)</p> <p>Residual VSA EVM: ≤ -42 dB (+20 to -20 dBm) ≤ -40 dB (+20 to -25 dBm) ≤ -35 dB (+20 to -30 dBm)</p> <p>Residual VSG EVM: ≤ -42 dB (-5 to -45 dBm)</p> <p>Note: 80 MHz 802.11ac waveform, measured system loopback</p>	
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.75 dB (+20 to -35 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)	<p>Residual VSA I/Q imbalance: $\leq 1\%$ (+20 to -35 dBm)</p> <p>Residual VSG I/Q imbalance: $\leq 1\%$ (-5 to -70 dBm)</p>	
I/Q phase error	I/Q phase imbalance (degrees) and approximate contribution to EVM (dB)	<p>Residual VSA I/Q imbalance: ≤ 0.5 degree (+20 to -35 dBm)</p> <p>Residual VSG I/Q imbalance: ≤ 0.5 degree (-5 to -70 dBm)</p>	
Frequency error	Carrier frequency error (kHz)	<p>(For 802.11n packet at 16 symbols, EVM better than -25 dB)</p> <p>VSA measurement error: $\leq \pm 0.2$ ppm calibrated</p>	
RMS phase noise	Integrated phase noise (degrees)	<p>VSA integrated phase noise: < 0.5 degrees (100 Hz to 1 MHz) (2200 to 2600 MHz) < 0.5 degrees (100 Hz to 1 MHz) (4900 – 6000 MHz)</p>	
PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ± 40 MHz		
Spectral mask	Transmit spectrum mask	IQxel80	± 60 MHz
		IQxel160	± 120 MHz

Measurement	Description	Performance
Spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11a/g OFDM signals only	VSA flatness over ≤ 80 MHz Ch BW: ± 0.5 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	

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 -35 dBm) ± 0.50 dB (+20 to -35 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 -35 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 (+ 5 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 -25 dBm)
Peak EVM (EDR)	Peak EVM for Bluetooth EDR	Residual VSG EVM: ≤ -35 dB (-5 to -70 dBm)

Note 1: IQxel support testing sensitivity with Dirty Packets

Bluetooth (4.0) Measurement Specifications

Measurement	Description	Performance
Output power at NOC ¹		VSA power accuracy: ± 0.75 dB (+20 to -35 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 -35 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: +9 to -95 dBm CW 0 to -95 dBm modulated
PER report integrity	Verifies the DUT PER report mechanism	

Note 1: NOC and EOC tests are the same except for the operating conditions which do not impact the test equipment requirements

Note 2: External signal source required for these measurements (not LitePoint supplied)

Note 3: IQxel provide the wanted signal only. No interfering signal is available

MIMO System Performance

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

Parameter	Port Designations	Range
VSA capture trigger accuracy		≤ ± 3.5 ns
VSA start trigger accuracy		≤ ± 3.5 ns

Port Descriptions

Front Panel

I/O	Function	Type
Power switch	Power on/off	Pushbutton switch
RF port 1	WiFi, Bluetooth input/output	N female
RF port 2	WiFi, Bluetooth 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 indicator	LED green – port is a VSA input LED red – port is a VSG output	LED indicator
RF port 2 indicator	LED green – port is a VSA input LED red – port is a VSG output	LED indicator
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A
IQ baseband port	Baseband port to enable IQ Baseband analog signals analysis	SCSI

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
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General and Environmental

Dimensions	Unit with handle: 15.5" W x 3.2" H x 20" D (370 mm W x 82 mm H x 508 mm D) Unit without handle: 14.7" W x 3.2" H x 17.1" D (373 mm W x 82 mm H x 434 mm D)
Weight	8.25 kg (18.2 pounds)
Power requirements	100 to 240 VAC, < 300 W, 50 to 60 Hz
Power consumption	<235 W (maximum), <10W (standby)
Recommended PC	Intel Core i5 2.5 GHz with 1GB of RAM or better
Recommended browser for optimal performance	Google Chrome R10 Release
Operating temperature	+10°C to +55°C (IEC EN60068-2-1, 2, 14)
Storage temperature	-20°C to +70°C (IEC EN60068-2-1, 2, 14)
Specification validity temperature	+20°C to +30°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

Programming Interface and Graphical User Interface (GUI)

Programmatic interface	C++ API (LitePoint IQapi) SCPI	
Driver compatibility	C++ LabVIEW 8.5 (using LitePoint supplied driver)	
IQxel Applications Graphical User Interface	WiFi (802.11) Bluetooth (1.x, 2.x, 3.0, 4.0)	GUI supports built-in measurement and signal generation functions per standard as appropriate

Order Codes

Code	Product
0100-IXEL-001	<p>IQxel Test System includes:</p> <ul style="list-style-type: none"> • 1VSA / 1VSG, 2200 to 2600, 4900 to 6000 MHz RF • WLAN Measurement Suite Software for SiSo 802.11a/b/g/n/p up to 40 MHz channel bandwidth • Graphical User Interface (GUI) with WLAN waveform generation capability • Programming Interface • 1 year hardware warranty and 1 year software maintenance updates
0100-IXEL-002	<p>IQxel80 Test System includes:</p> <ul style="list-style-type: none"> • 1VSA / 1VSG, 2200 to 2600, 4900 to 6000 MHz RF • WLAN Measurement Suite Software for SiSo 802.11a/b/g/n/p/ac up to 80 MHz channel bandwidth • Graphical User Interface (GUI) with WLAN waveform generation capability • Programming interface • 1 year hardware warranty and 1 year software maintenance updates
0100-IXEL-003	<p>IQxel160 Test System includes:</p> <ul style="list-style-type: none"> • 2VSA / 2VSG, 2200 to 2600, 4900 to 6000 MHz RF • WLAN Measurement Suite Software for SiSo 802.11a/b/g/n/p/ac up to 160 MHz and 80+80 MHz channel bandwidth • Graphical User Interface (GUI) with WLAN waveform generation capability • Programming interface • 1 year hardware warranty and 1 year software maintenance updates
0100-IXEL-004	Baseband I/O capability. Includes SMB to SMA connectors and breakout board.
0100-IXEL-005	WLAN MIMO license enabling MIMO option for 802.11n and 802.11ac. Includes 9 BNC connectors and 6T-connectors.
0300-IXEL-001	<p>Bluetooth Measurement Suite Software License for IQxel test systems</p> <p>Includes Bluetooth versions 1.x, 2.x, 3.0, 4.0.</p> <p>Includes 1 year software maintenance updates.</p>
0300-IXEL-004	WLAN 802.11ac Measurement Suite for IQxel

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