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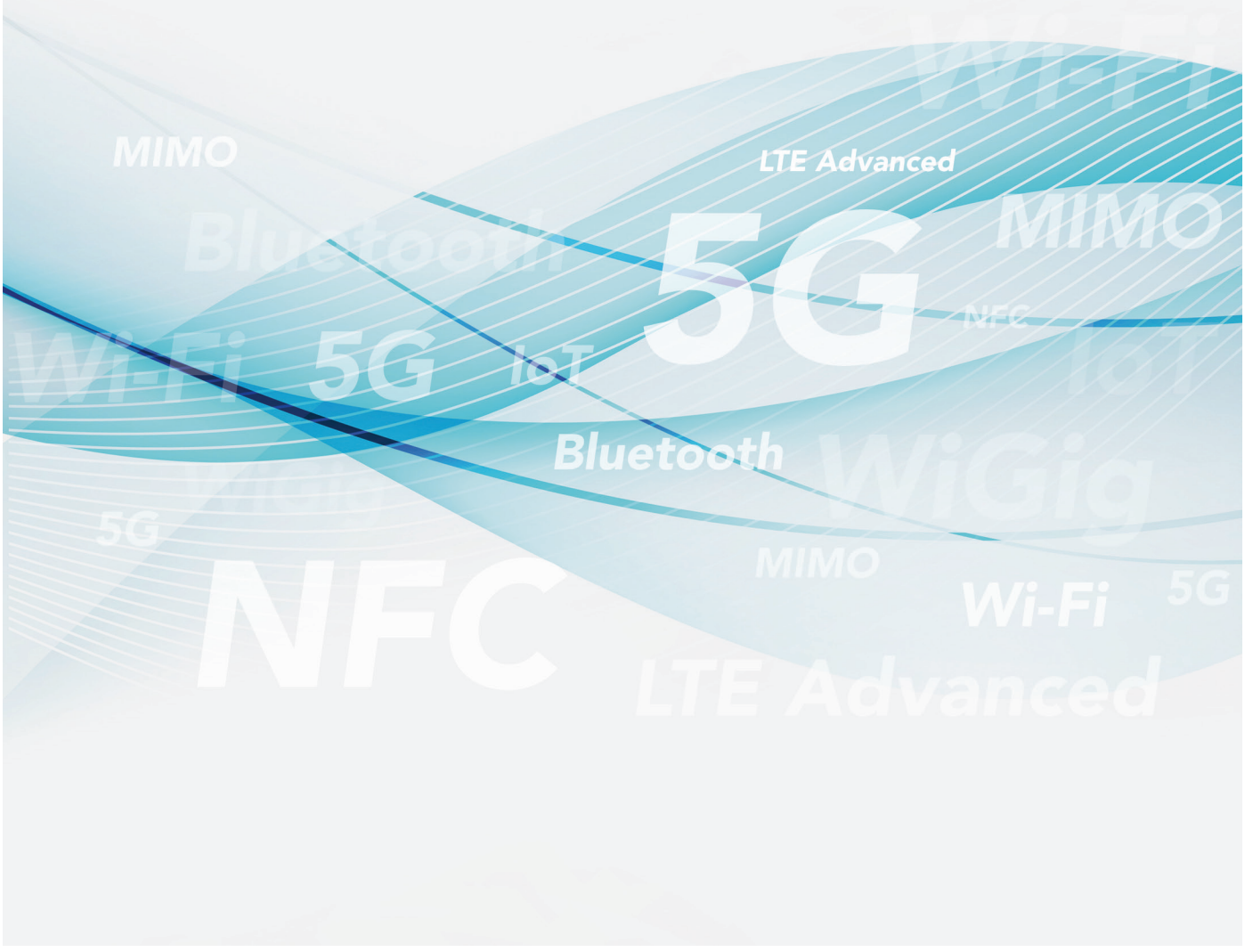
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iQgig-RF

TECHNICAL SPECIFICATIONS

IQgig-RF™
Technical Specifications



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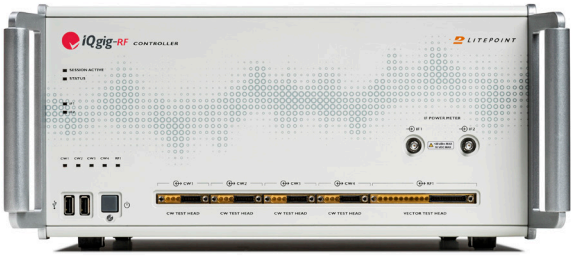
IQgig-RF is a scalable physical-layer test solution, tailored for 802.11ad (WiGig) RF modules and final products. Flexible, remote test heads enable simple Over-the-Air (OTA) signal generation and analysis for the device under test (DUT). IQgig-RF's unique direct baseband-to-60 GHz design minimizes spurs, and provides the best-in-class low noise performance. Supporting up to the maximum 802.11ad physical-layer data rate, whether in the engineering labs or on manufacturing floors, IQgig-RF ensures that the DUT performance specifications are fully met.

IQgig-RF Features

- Complete physical layer test coverage of 802.11ad standards in one box
- Full 802.11ad band coverage: 55 GHz to 68 GHz, 2 GHz bandwidth
- Small test head size simplifies test chamber integration
- Optional 1 to 4 RF CW test heads per test module to perform flexible and quick, radiated power measurements

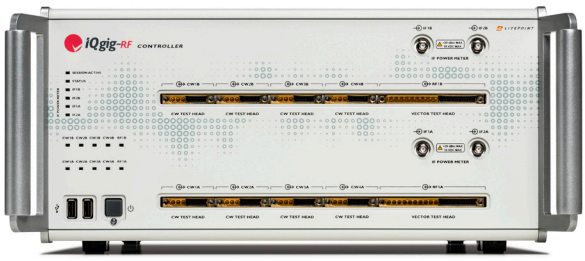
One Instrument – Two Configurations

Available in a Single-DUT or Dual-DUT configuration.



Single-DUT Configuration with One Module

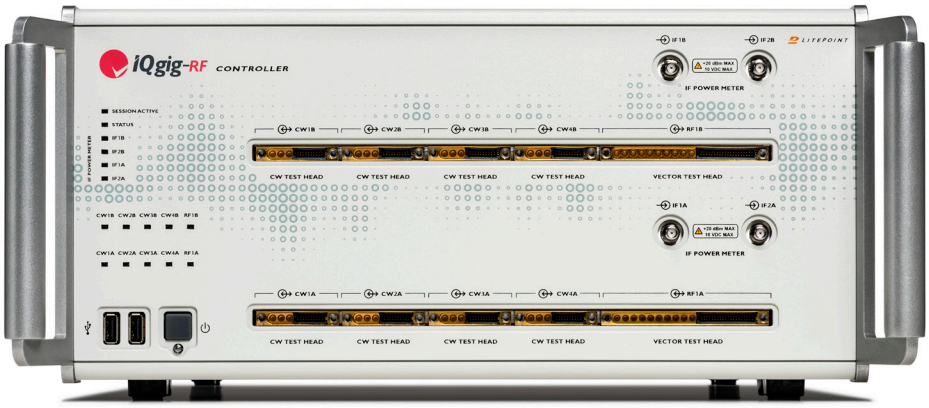
Highly efficient in a lab environment or on a small volume production floor, the Single-DUT version of IQgig-RF provides full functionality of IQgig-RF, with 1 vector test head, and optional 1 to 4 RF CW test heads.



Dual-DUT Configuration with Two Modules

The two independent Test Modules in the Dual-DUT version of IQgig-RF enable true-parallel testing, providing the x2 throughput. Ideal for high-volume production floors. It includes 2 vector test heads, and optional 1 to 8 RF CW test heads.

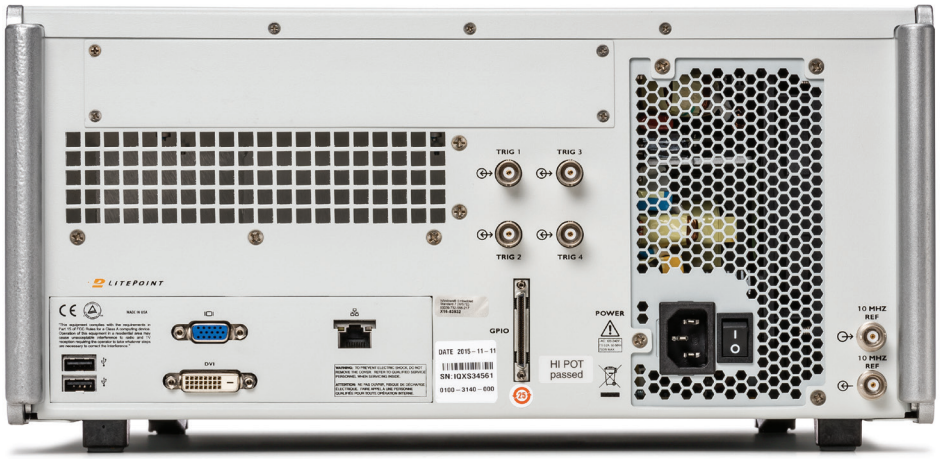
Port Descriptions



IQgig-RF Test Controller Front Panel

I/O	Function	Type
Power switch	Power On/Off	Pushbutton Switch
Power indicator	LED Red – Powered Up, Standby LED Green – Powered Up, Running	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
USB (2)	USB Input / Output	Type A
RF1A	Vector Test Head Connection	Proprietary Mixed-Signal Connector
CW1A	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW2A	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW3A	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW4A	CW Test Head Connection	Proprietary Mixed-Signal Connector
RF1B	Vector Test Head Connection	Proprietary Mixed-Signal Connector
CW1B	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW2B	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW3B	CW Test Head Connection	Proprietary Mixed-Signal Connector
CW4B	CW Test Head Connection	Proprietary Mixed-Signal Connector
IF1A	IF Input	SMA female
IF2A	IF Input	SMA female
IF1B	IF Input	SMA female
IF2B	IF Input	SMA female
Test head indicators	LED Green - Test Head is an input LED Red - Test Head is an output	LED indicator
IF power meter indicators	LED Green – Power meter is on	LED indicator

'A' denotes the first/bottom module and 'B' denotes the second/top module. In the Single-DUT version, the first module is implied.



IQgig-RF Test Controller Rear Panel General I/O

I/O	Function	Type
10 MHz REF In	10 MHz Reference In	BNC female
10 MHz REF Out	10 MHz Reference Out	BNC female
TRIG 1	TTL Trigger Input / Output	BNC female
TRIG 2	TTL Trigger Input / Output	BNC female
TRIG 3	TTL Trigger Input / Output	BNC female
TRIG 4	TTL Trigger Input / Output	BNC female
GPIO	General Purpose Input / Output	50-pin connector

IQgig-RF Test Controller Communication I/O

I/O	Function	Type
VGA	Video Output	15 pin DSUB
DVI	Video Output	DVI-I
USB 1	USB I/O – Keyboard	Type A
USB 2	USB I/O – Mouse	Type A
LAN 1	1000 Base-T LAN	RJ-45



Note: Test heads do not include horn antennas

IQgig-RF Vector Test Head (VTH) I/O

I/O	Function	Type
Controller interface	Connection to Test Controller	Proprietary Mixed-Signal Connector
Test port	RF I/O	WR-15
Status indicator	LED Green - Power on, normal operation	LED indicator



Note: Test heads do not include horn antennas

IQgig-RF CW Test Head (CTH) I/O

I/O	Function	Type
Controller interface	Connection to Test Controller	Proprietary Mixed-Signal Connector
Test port	RF I/O	WR-15
Status indicator	LED Green - Power on, normal operation	LED indicator

General Hardware Specifications

RF Vector Signal Analyzer (Vector Test Head)[1]

Parameter	Ports	Value
Frequency range	TEST PORT	55 to 68 GHz EVM Measurements available at: CHAN 1: 58.32 GHz CHAN 2: 60.48 GHz CHAN 3: 62.64 GHz CHAN 4: 64.80 GHz
RF bandwidth	TEST PORT	1.9 GHz
Input power maximum	TEST PORT	+15 dBm peak
Input power range	TEST PORT	0 to -70 dBm
Input power accuracy	TEST PORT	± 1.5 dB (-5 to -55 dBm)
Spurious (non-harmonics)	TEST PORT	< -50 dBc (50 kHz RBW) (CW) at Input Power = -10 dBm
Spectral flatness	TEST PORT	≤ ± 0.8 dB (± 850 MHz)
Inherent spurious floor	TEST PORT	≤ -80 dBm at minimum input attenuation , 1 MHz RBW
Noise figure	TEST PORT	≤ 20 dB at minimum input attenuation
Integrated phase noise	TEST PORT	< 0.8 degrees RMS (100 kHz to 100 MHz)
Digitizer resolution	TEST PORT	12 bits
Sampling data rate	TEST PORT	2.4 GS/s
Waveform capture duration	TEST PORT	50 ms
Absolute minimum trigger level	TEST PORT	Wideband RF: -30 dBm Video: -40 dBm
Absolute maximum trigger level	TEST PORT	0 dBm
Trigger relative threshold	TEST PORT	30 dB
Trigger level accuracy	TEST PORT	< ±2 dB

1 All specifications referenced to the WG flange Antenna connection at test head

RF Vector Signal Generator (Vector Test Head)[1]

Parameter	Ports	Value
Frequency range	TEST PORT	CHAN 1: 58.32 GHz CHAN 2: 60.48 GHz CHAN 3: 62.64 GHz CHAN 4: 64.80 GHz
RF bandwidth	TEST PORT	1.9 GHz
Output power settable range	TEST PORT	+5 to -70 dBm
Output power accuracy	TEST PORT	CW: ± 2.0 dB (+5 to -40 dBm), ±3 dB (<-40 dBm)
Spurious (in channel)[2]	TEST PORT	< -35 dBc CW, or -75 dBm
Spurious (out of channel)[3]	TEST PORT	< -20 dBc CW, or -60 dBm, whichever is higher[4]
Spectral flatness	TEST PORT	≤ ±0.8 dB (±850 MHz)
Integrated phase noise	TEST PORT	< 0.8 degrees RMS (100 kHz to 100 MHz)
Carrier leakage	TEST PORT	< -30 dBc CW (Output power: +5 to -30 dBm)
Generator resolution	TEST PORT	14 bits
Sampling data rate	TEST PORT	2.4 GS/s
Waveform playback duration	TEST PORT	200 ms

RF Power Meter (CW Test Head, up to 4 Heads)[1]

Parameter	Ports	Value
Frequency range	TEST PORT	55 to 68 GHz
Maximum input power	TEST PORT	+15 dBm peak
Power range	TEST PORT	-10 to -50 dBm
Power measurement accuracy (CW)	TEST PORT	±1 dB (-10 to -40 dBm), ±2 dB (-40 to -50 dBm)
Frequency tuning time	TEST PORT	< 50 ms

1 All specifications referenced to the WG flange Antenna connection at test head
2 Carrier frequency ± 1 GHz
3 Up to carrier Frequency ± 8 GHz
4 55 to 68 GHz

RF CW Generator (CW Test Head, up to 4 Heads)[1]

Parameter	Ports	Value
Frequency range	TEST PORT	55 to 68 GHz
Output power range	TEST PORT	+5 to -40 dBm
Output power accuracy	TEST PORT	± 2.0 dB (+5 to -40 dBm)
Spurious (in channel)[2]	TEST PORT	< -25 dBc CW, or -65 dBm, whichever is higher
Spurious (out of channel)[3]	TEST PORT	< -20 dBc CW, or -60 dBm, whichever is higher
Carrier leakage	TEST PORT	< -20 dBc relative to total transmit power At Output Power 0 to -20 dBm

IF Power Meter

Parameter	Ports	Value
RF frequency range	IF1, IF2	7 to 14 GHz
Maximum input power	IF1, IF2	+20 dBm peak
Power range (CW)	IF1, IF2	+5 to -35 dBm
Power measurement accuracy (CW)	IF1, IF2	+0.75 dB
Input return loss	IF1, IF2	> 10 dB
Port to Port isolation	IF1, IF2	> 35 dB
Frequency tuning time	IF1, IF2	< 50 ms

1 All specifications referenced to the WG flange Antenna connection at test head

2 Carrier frequency ± 1 GHz

3 Up to carrier Frequency ± 8 GHz

Wireless LAN (802.11ad) Measurement Specification (Vector Test Head)[1]

Measurement	Description	Performance
EVM	EVM averaged over payload based on standard requirements	(Averaged over 20 CPHY/SC packets, 512+/1000+ data symbols long) Preamble only channel estimation Residual VSA EVM: ≤ -30 dB MCS12 (-10 to -33dBm) VSA EVM degrades below (-33 dBm to -45 dBm) Residual VSG EVM: ≤ -30 dB MCS12 (-10 to -33dBm)
TX peak power	Peak power over all symbols (dBm)	VSA power accuracy: ±1.5 dB (-5 to -55 dBm) Pending data
TX 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)	
TX max average power	Peak value of the amplitude as a moving average over 40 samples (dBm)	
TX frequency error	Carrier frequency error (kHz)	VSA measurement error: ≤ ±0.2 ppm calibrated
TX RMS phase noise	Integrated phase noise (degrees)	VSA residual integrated phase noise: < 0.8 degrees RMS (100 kHz to 100 MHz)
TX PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ±850 MHz	
TX spectral mask	Transmit spectrum mask	±3.06 GHz, Data packets longer than 10 µs without training fields, RBW = 1 MHz
TX spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11ad OFDM signals only	VSA flatness over <1.9 GHz Channel ≤ ±0.8 dB
TX center freq. (LO) leakage (LOFT)		VSA residual < -35 dBc with respect to overall transmit power
TX CCDF (complementary cumulative distribution function)	Probability of peak signal power being greater than a given power level versus peak-to-average power ratio (dB)	
TX center frequency convergence	Converge to within 1ppm of its final value from the start of the packet.	
TX power on / power down ramp	10 to 90% of average frame power	

1 All specifications referenced to the WG flange Antenna connection at test head

TX PSDU data	Recovered binary data sequence, including the MAC header and Frame Check Sequence, if present	
TX raw capture data	I and Q signals versus time	
TX general waveform analysis	DC offset, RMS level, minimum/maximum amplitude, peak-to peak amplitude, RMS I- and Q-channel levels	
TX CW frequency analysis	Frequency & power of CW tone	
RX sensitivity	Receiver sensitivity	VSG power accuracy (CW): ± 2.0 dB (+5 to -40 dBm), ±3 dB (<-40 dBm)
RX maximum input level		VSG settable power range: +5 to -70 dBm

Wireless LAN (802.11ad) Measurement Specification (CW Test Head)[1]

Measurement	Description	Performance
TX power	CW only	Power accuracy: ± 2.0 dB (+5 to -40 dBm), ±3dB (<-40 dBm) 55 to 68 GHz
TX beamforming	CW only	
RX beamforming	CW only	

Wireless LAN (802.11ad) Measurement Specification (IF Power Meter)

Measurement	Description	Performance
IF power	Power level of CW IF signal	Power accuracy: +0.75 dB (+5 to -35 dBm, 7 to 14 GHz)

Timebase

Parameters	Value
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 ±0.1ppm at 25°C)	< 30 minutes

1 All specifications referenced to the WG flange Antenna connection at test head

General and Environmental

Parameters	Value
Dimensions	Controller: 16.75" W x 7.4" H x 24" D (426 mm x 188 mm x 610 mm) Test head: 6.2" L x 4.8" D x 1.9" H (157mm x 122 mm x 45 mm)
Weight	Controller: 37.8 pounds (17.1 kg) Vector test head and cable: 3.7 pounds (1.7 kg)
Power consumption (maximum)	<350W
Power consumption (average)	150 W
Power requirements	100 - 240 VAC, 50-60 Hz
Supported browsers	Google Chrome, Mozilla Firefox
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 35°C (valid range for specifications)
Operating humidity	15% to 95% relative humidity, non-condensing (IEC EN60068-2-30)
EMC	EN61326-1 Class A, EN55011
EMI (Immunity)	EN61000-4
Safety	IEC 61010-1, EN61010-1, UL61010-1:2012 and CAN/CSA-C22.2 No. 61010-1-12
Mechanical vibration	IEC 60068-2-6 for Sine Vibration and MIL-STD 810G for Random Vibration
Mechanical shock	ASTM D3332-99
Recommended connector torque	SMA: 7 lb-in (0.791 N-m) Test head cable: 5 lb-in (0.565 N-m)
Recommended calibration cycle	12 months
Warranty	12 months hardware, 12 months software updates

Order Codes

Code	Product
0100-IGIG-001	IQgig-RF Test System. Includes 1 Vector Test Head. Can be optionally configured with 1 to 4 CW test heads.
0100-IGIG-003	IQgig-RF Dual-DUT Test System. Includes 2 Vector Test Heads. Can be optionally configured with 1 to 8 CW test heads.
0150-IGIG-001	IQgig-RF CW Test Head (Optional)

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