LitePoint IQxstream-M™

LITEPOINT

IQxstream-M is a manufacturing-oriented, multi-device, physical layer communication system tester, tailored to calibrating and verifying performance in high volume production environments. Non-signaling physical layer testers offer 3x or better test throughput when compared against signaling based methodologies typical of R&D and conformance testing. IQxstream-M addresses all major wireless technologies and RF bands including cellular, wireless LAN (Wi-Fi), navigation, and other common wireless standards in support of the Smartphone, Tablet, Data-Card, Module, IoT, Small Cell base stations, and other mobile connectivity consumer devices.

IQxstream-M supports the following wireless technologies:

Cellular

- LTE / LTE-Advanced / LTE-Advance Pro
- LTE Cat 0 (Cat-M1) and LTE Cat-NB1 (NB-IoT)
- W-CDMA / HSPA / HSPA+
- GSM / EDGE
- CDMA2000 / 1xEV-DO
- TD-SCDMA

Connectivity

- 802.11a/b/g/n/j/p/ac/af/ah
- Bluetooth 1.0, 2.x, 3.0, 4.x, 5
- Navigation: GPS, GLONASS
- ZigBee (802.15.4)
- DECT
- SISO and MIMO Antenna Configurations

Port Descriptions

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
USB (2)		USB I/O	Type A
RF1 Bank 1, RF1 Bank 2	ROUT11	VSG / VSA Ports	BMA Male
RF2 Bank 1, RF2 Bank 2		VSG / VSA Ports	BMA Male
RF3 Bank 1, RF3 Bank 2		VSG / VSA Ports	BMA Male
RF4 Bank 1, RF4 Bank 2		VSG / VSA Ports	BMA Male
RF1 Bank 1, RF1 Bank 2	ROUT12	VSG / VSA Ports	BMA Male
RF2 Bank 1, RF2 Bank 2		VSG / VSA Ports	BMA Male
RF3 Bank 1, RF3 Bank 2		VSG / VSA Ports	BMA Male
RF4 Bank 1, RF4 Bank 2		VSG / VSA Ports	BMA Male
RF1 Bank 1, RF1 Bank 2 (optional)	ROUT13	VSG / VSA Ports	BMA Male
RF2 Bank 1, RF2 Bank 2 (optional)		VSG / VSA Ports	BMA Male
RF3 Bank 1, RF3 Bank 2 (optional)		VSG / VSA Ports	BMA Male
RF4 Bank 1, RF4 Bank 2 (optional)		VSG / VSA Ports	BMA Male
RF1 Bank 1, RF1 Bank 2 (optional)	ROUT14	VSG / VSA Ports	BMA Male
RF2 Bank 1, RF2 Bank 2 (optional)		VSG / VSA Ports	BMA Male
RF3 Bank 1, RF3 Bank 2 (optional)		VSG / VSA Ports	BMA Male
RF4 Bank 1, RF4 Bank 2 (optional)		VSG / VSA Ports	BMA Male
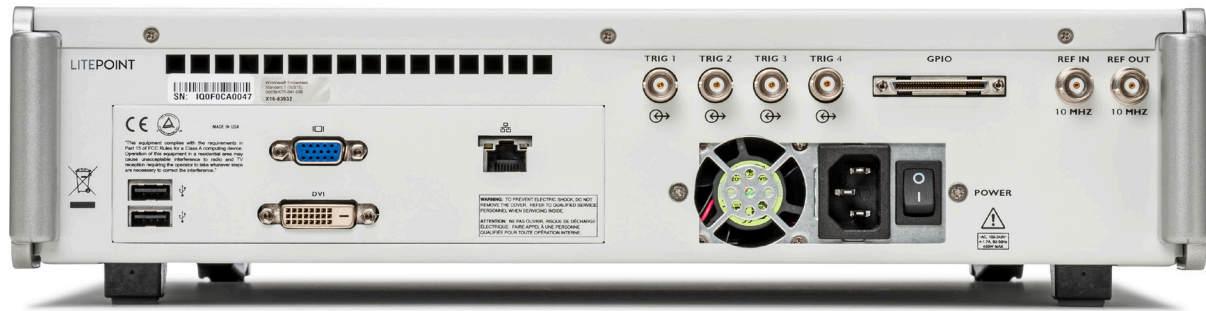
Rear Panel
General I/O

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

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	1000 Base-T LAN	RJ-45
GPIO	General Purpose I/O	50-Pin Connector

General Hardware Specifications

Vector Signal Analyzer (VSA)

Parameters	Ports	Value
RF Frequency Range	All Ports	75 MHz to 6000 MHz
RF Maximum Input Power		+36 dBm (peak envelope power)[1]
Effective Sample Rate		61.44 Msps
Capture Memory Depth		64 Msamples
Measurement Frequency Resolution		0.1 Hz
Input Impedance		50 Ω (nominal)
Power Measurement Accuracy[2, 3]		< ± 1 dB (level > -40 dBm), 75 MHz to 300 MHz < ± 0.4 dB (level > -40 dBm), 300 MHz to <3800 MHz < ± 0.5 dB (level > -40 dBm), 3800 MHz to 6000 MHz
Power Measurement Repeatability		< 0.1 dB (within 30 seconds of initial value), signal level > -40 dBm
Noise Figure		<30 dB (at MIN attenuation), 300 MHz to <700 MHz <29 dB (at MIN attenuation), 700 MHz to <4000 MHz <40 dB (at MIN attenuation), 4000 MHz to 6000 MHz
Signal to Noise Ratio		> 90 dB @ RBW = 1 kHz, input > -10 dBm, 400 MHz to <2000 MHz > 80 dB @ RBW = 1 kHz, input > -10 dBm, 2000 MHz to 6000 MHz
VSWR		< 1.6 : 1 (RL > 12.5 dB) 400 MHz to < 700 MHz < 1.3 : 1 (RL > 17 dB) 700 MHz to 3400 MHz < 1.8 : 1 (RL > 11 dB) > 3400 MHz
Port Switching Time[4]		< 50 µs (to within 0.1 dB)
Isolation	RF1 to RF4 Within a Bank of Ports	Port-to-Port, VSG Duplex Mode > 55 dB (75 MHz to <2400 MHz) > 40 dB (2400 MHz to 6000 MHz)
		Port-to-Port, VSG Broadcast Mode > 40 dB (75 MHz to <2500 MHz) > 55 dB (2500 MHz to <4000 MHz) > 45 dB (4000 MHz to 6000 MHz)
	RF1 – RF4, Between ROUT Modules	> 100 dB (75 MHz to 3800 MHz) > 90 dB (> 3800 MHz)

[1] Maximum peak envelope power at +36 dBm is specified for a GSM signal at 1/8th duty cycle
[2] Specifications valid when quality interface cables are used. Please contact LitePoint for recommended interface options
[3] For power levels above +30 dBm, add an additional +/- 0.1 dB of uncertainty
[4] When using hardware sequencing control

Parameters	Ports	Value
Inherent Spurious Signals Floor (no input signal applied, RLEV = -10 dBm)	All Ports	< -75 dBm (<700 MHz) < -85 dBm (700 MHz to <2700 MHz) < -75 dBm (2700 MHz to 6000 MHz)
Input third order intercept point (IIP3)		> +40 dBm (at MAX attenuation)
Non-harmonic Attenuation		> 50 dB (Input level < +15 dBm)
Harmonic Attenuation		> 40 dB (400 MHz to 6000 MHz) > 10 dB (< 400 MHz)
Phase Noise		< -108 dBc/Hz @ 900 MHz (250 kHz to 400 kHz offset) < -102 dBc/Hz @ 1800 MHz (250 kHz to 400 kHz offset) < -101 dBc/Hz @ 2400 MHz (250 kHz to 400 kHz offset) < -93 dBc/Hz @ 5800 MHz (250 kHz to 400 kHz offset)

Vector Signal Generator (VSG)

Parameters	Ports	Value
RF Frequency Range	All RF Ports	75 MHz to 6000 MHz
RF Output Power Range (Duplex)		-15 dBm to -120 dBm (75 MHz to 3800 MHz)
		-25 dBm to -120 dBm (> 3800 MHz to 6000 MHz)
RF Output Power Range (Broadcast)		-12 dBm[1] to -120 dBm (400 MHz to 3000 MHz)
		-50 dBm to -120 dBm (>3000 MHz to 6000 MHz)
Center Frequency Resolution		0.1 Hz
Power Level Resolution		0.1 dB
Power Level Settling Time[2]		< 50 us to within 0.1 dB
Frequency Level Settling Time		< 400 us to within 1 kHz
Output Power Accuracy (Duplex & VSG mode)[3]		< ± 1 dB typical (level > -40 dBm), 75 MHz to <300 MHz ± 0.5 dB (levels ≥ -50 dBm), 300 MHz to <3800 MHz ± 0.75 dB (levels ≥ -50 dBm), 3800 MHz to 6000 MHz
		± 0.75 dB (-100 to < -50 dBm), 300 MHz to 3800 MHz ± 1 dB (-100 to < -50 dBm), 3800 MHz to 6000MHz
Broadcast Mode Output Power Uncertainty	RF1 – RF4, Within a Bank	± 0.75 dB + VSG Power Accuracy ± 0.25 dB (typical) + VSG Power Accuracy All ports in 50 ohms
Power Level Repeatability	All Ports	± 0.1 dB (within 30 seconds of initial value)
VSWR		< 1.6 : 1 (RL > 12.5 dB) 400 MHz to < 700 MHz < 1.3 : 1 (RL > 17 dB) 700 MHz to 3400 MHz < 1.8 : 1 (RL > 11 dB) > 3400 MHz

[1] -12 dBm enabled in firmware v1.9 and later
[2] When using hardware sequencing control
[3] Specifications valid when quality interface cables are used. Please contact LitePoint for recommended interface options.

Harmonic Attenuation	All Ports	< -40 dBc (output levels < -30 dBm), 350 MHz to 6000 MHz
Non-harmonic Attenuation		< -35 dBc (output levels < -30 dBm), 400 MHz to 6000 MHz
Phase Noise		< -108 dBc/Hz @ 900 MHz (250 kHz to 400 kHz offset) < -102 dBc/Hz @ 1800 MHz (250 kHz to 400 kHz offset) < -101 dBc/Hz @ 2400 MHz (250 kHz to 400 kHz offset) < -93 dBc/Hz @ 5800 MHz (250 kHz to 400 kHz offset)

Timebase

Parameters	Value
Oscillator Type	OCXO
Frequency	10 MHz
Initial Accuracy (25°C, After 60 Minute Warm-Up)	< ± 0.04 ppm
Maximum Aging	< ± 0.1 ppm per year
Temperature Stability	< ± 0.05 ppm over 0°C to 50°C range, referenced to 25°C < ± 0.01 ppm over 20°C to 35°C range
Warm-Up Time	60 minutes

General Purpose RF

Signal Generator

Controls	Description	Setting Range
Frequency	Sets the VSG center frequency	See General HW Specifications
Output Power Level	Sets the VSG output power level	See General HW Specifications

Vector Signal Analyzer

Controls	Description	Setting Range
Frequency	Sets the VSA center frequency	See General HW Specifications
Reference Level	Sets the VSA input power range	+36 dBm to -5 dBm
Resolution Bandwidth (RBW)	Sets the VSA resolution bandwidth	1 Hz to 10 MHz
Sample Rate	Sets the VSA sample rate	See General HW Specifications
Capture Length	Sets the capture time	See General HW Specifications
Trigger Source	Sets the trigger input source	VSG11, VSG12, VSG13, VSG14, EXT1,2,3,4
Trigger Level	Sets the RF trigger level	See General HW Specifications
Edge Level	Sets rising or falling edge trigger direction	

Graphic Display

Controls	Description
Power in Band Table	Integrated power results (up to 10 results)
Spectrum (PSD)	Spectrum Display (Power vs. Frequency), Up to 30 MHz span

Factory Efficiency Module

The Factory Efficiency Module allows you to detect and repair test fixture wear and tear as well as improve test yield.
These features are tailored specifically for issues that are common in the manufacturing environment.

Measurement	Description
Fixture Health Check	Detects any signal integrity change between the tester and the end of the test fixture that could negatively impact RF measurements
DUT Sense	Detects that a DUT has been correctly placed in the test fixture by ensuring that the DUT antenna connection to the tester is of good quality
Return Loss	A magnitude measurement of the reflected signal as seen by the tester RF port
Fixture Health Check minimum detectable path change	0.05 dB[1]
Fixture Health Check maximum external pathloss	15 dB
Return Loss Magnitude Uncertainty[2]	<±1 dB, 450 MHz to 4000 MHz, RL > -12 dB

[1] Relative to fixture reference measurement
[2] Trace filtering applied

General and Environmental

Parameters	Value
Dimensions	14.5" W x 3.2" H x 20.5" D (368 mm x 82 mm x 521 mm)
Weight	24 pounds (11 kg)
Power consumption	< 350 W
Average power consumption	< 180 W
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[1]	20°C to 35°C
Operating / storage 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 calibration cycle	24 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. Temperature compensation is effective for frequencies: 400 MHz to 6000 MHz.

Wireless Standards Support

IQxstream-M supports a wide variety of wireless standards and tests. As a software driven instrument, these capabilities will be updated from time to time to meet the needs of changing requirements. This includes the addition of new bands or enhancements to the standards.

At the time of this document's publication, IQxstream-M includes direct support for the standards based testing documented in the following tables. In addition to the tests noted, other measurements are often available that extend or provide additional information surrounding a specific test. For details of such additional support, please see the IQxstream-M user documentation.

IQxstream-M supports a continuous frequency range between 75 MHz and 6,000 MHz. Technology-specific frequency band support is detailed in the following section, but does not imply that frequency support is restricted only to the band listed.

Many standards specify tests under very specific test conditions. For example all standards contain a variety of power tests e.g. Max Power, Minimum Power, etc. IQxstream-M fundamentally measures power. If you can set the DUT to the particular state, IQxstream-M will measure its power, and additionally EVM, carrier frequency and a variety of generic measurements. Support for a specific test as described in the following pages does not impose any limitation on IQxstream-M capabilities. It only describes a minimum feature set included with the tester. IQxstream-M can do far more, and perhaps more importantly, can have specific capabilities added to it via software updates to meet application-specific needs.

LTE Frequency Bands Supported

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
1	2110 MHz to 2170 MHz	1920 MHz to 1980 MHz	FDD
2	1930 MHz to 1990 MHz	1850 MHz to 1910 MHz	FDD
3	1805 MHz to 1880 MHz	1710 MHz to 1785 MHz	FDD
4	2110 MHz to 2155 MHz	1710 MHz to 1755 MHz	FDD
5	869 MHz to 894 MHz	824 MHz to 849 MHz	FDD
7	2620 MHz to 2690 MHz	2500 MHz to 2570 MHz	FDD
8	925 MHz to 960 MHz	880 MHz to 915 MHz	FDD
9	1845 MHz to 1880 MHz	1750 MHz to 1785 MHz	FDD
10	2110 MHz to 2170 MHz	1710 MHz to 1770 MHz	FDD
11	1476 MHz to 1496 MHz	1428 MHz to 1448 MHz	FDD
12	728 MHz to 746 MHz	698 MHz to 716 MHz	FDD
13	746 MHz to 756 MHz	777 MHz to 787 MHz	FDD
14	758 MHz to 768 MHz	788 MHz to 798 MHz	FDD
17	734 MHz to 746 MHz	704 MHz to 716 MHz	FDD
18	860 MHz to 875 MHz	815 MHz to 830 MHz	FDD
19	875 MHz to 890 MHz	830 MHz to 845 MHz	FDD
20	791 MHz to 821 MHz	832 MHz to 862 MHz	FDD

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
21	1495.9 MHz to 1510.9 MHz	1447.9 MHz to 1462.9 MHz	FDD
22	3510 MHz to 3590 MHz	3410 MHz to 3490 MHz	FDD
23	2180 MHz to 2200 MHz	2000 MHz to 2020 MHz	FDD
24	1525 MHz to 1559 MHz	1626.5 MHz to 1660.5 MHz	FDD
25	1930 MHz to 1995 MHz	1850 MHz to 1915 MHz	FDD
26	859 MHz to 894 MHz	814 MHz to 849 MHz	FDD
27	852 MHz to 869 MHz	807 MHz to 824 MHz	FDD
28	758 MHz to 803 MHz	703 MHz to 748 MHz	FDD
29	717 MHz to 728 MHz	Downlink Only	FDD
30	2350 MHz to 2360 MHz	2305 MHz to 2315 MHz	FDD
31	462.5 MHz to 467.5 MHz	452.5 MHz to 457.5 MHz	FDD
33	1900 MHz to 1920 MHz	1900 MHz to 1920 MHz	TDD
34	2010 MHz to 2025 MHz	2010 MHz to 2025 MHz	TDD
35	1850 MHz to 1910 MHz	1850 MHz to 1910 MHz	TDD
36	1930 MHz to 1990 MHz	1930 MHz to 1990 MHz	TDD
37	1910 MHz to 1930 MHz	1910 MHz to 1930 MHz	TDD
38	2570 MHz to 2620 MHz	2570 MHz to 2620 MHz	TDD
39	1880 MHz to 1920 MHz	1880 MHz to 1920 MHz	TDD
40	2300 MHz to 2400 MHz	2300 MHz to 2400 MHz	TDD
41	2496 MHz to 2690 MHz	2496 MHz to 2690 MHz	TDD
42	3400 MHz to 3600 MHz	3400 MHz to 3600 MHz	TDD
43	3600 MHz to 3800 MHz	3600 MHz to 3800 MHz	TDD
44	703 MHz to 803 MHz	703 MHz to 803 MHz	TDD

LTE Terminal Tests for UE Categories 1 through 12, Cat-0 (Cat-M1), and Cat-NB1 (NB-IoT)

Standard Test	3GPP TS 36.521-1 Reference Paragraph	Notes
Maximum output power	6.2.2	
Maximum power reduction	6.2.3	
Transmit on/off time mask	6.3.4	
Minimum output power	6.3.2	
Transmit off power	6.3.3	
Power control absolute	6.3.5.1	
Power control relative	6.3.5.2	
Frequency error	6.5.1	
Error vector magnitude	6.5.2.1	
EVM equalizer spectrum flatness	6.5.2.4	
Carrier leakage	6.5.2.2	
Occupied bandwidth	6.6.1	
In-band emissions for non-allocated RB	6.5.2.3	
ACLR	6.6.2.3	
Spectrum emission mask	6.6.2.1	
Spurious emissions	6.6.3.1	75 MHz to 6 GHz
Reference sensitivity	7.3	DUT support required
Maximum input level	7.4	DUT support required
RX level		DUT support required. A common test as part of device calibration / verification.

LTE Small Cell Base Station Tests

Standard Test	3GPP TS 36.521-1 Reference Paragraph	Notes
Maximum output power	6.2.2	
Home BS output power for adjacent UTRA channel protection	6.2.6	
Home BS output power for adjacent E-UTRA channel protection	6.2.7	
Transmit off power	6.4.1	
Frequency error	6.5.1	
Error vector magnitude	6.5.2	
Occupied bandwidth	6.6.1	
ACLR	6.6.2	
Operating band unwanted emissions	6.6.3	
Transmitter spurious emissions	6.6.4	75 MHz to 6000 MHz
Reference sensitivity	7.2	DUT support required

WCDMA/HSPA/HSPA+/Dual Carrier HSPA+ Frequency Bands

Bands	Frequency Range (Analyzer)	Frequency Range (Generator)
I	1920 - 1980 MHz	2110 - 2170 MHz
II	1850 - 1910 MHz	1930 - 1990 MHz
III	1710 - 1785 MHz	1805 - 1880 MHz
IV	1710 - 1755 MHz	2110 - 2155 MHz
V	824 - 849 MHz	869 - 894 MHz
VI	830 - 840 MHz	875 - 885 MHz
VII	2500 - 2570 MHz	2620 - 2690 MHz
VIII	880 - 915 MHz	925 - 960 MHz
IX	1749.9 - 1784.9 MHz	1844.9 - 1879.9 MHz
X	1710 - 1770 MHz	2110 - 2170 MHz
XI	1427.9 - 1447.9 MHz	1475.9 - 1495.9 MHz
XII	698 - 716 MHz	728 - 746 MHz
XIII	777 - 787 MHz	746 - 756 MHz
XIV	788 - 798 MHz	758 - 768 MHz

WCDMA/HSPA/HSPA+/Dual Carrier HSPA+Terminal Tests

Bands	Frequency Range (Analyzer)	Frequency Range (Generator)
Maximum output power	5.2	
Minimum output power	5.4.3	
Transmitter off power	5.5.1	
Inner loop power control	5.4.2	
Frequency error	5.3	
Error Vector Magnitude (EVM)	5.13.1	
Phase discontinuity	5.13.3	
I/Q mismatch	5.13.1AAA	
Occupied BW	5.8	
Peak code domain error	5.13.2	
ACLR	5.10	
Spectrum Emission Mask (SEM)	5.9	
Spurious emissions	5.11	75 MHz to 6 GHz
Reference sensitivity	6.2, 6.2A	DUT support required
Maximum input level	6.3, 6.3B	DUT support required
RX level		DUT support required. A common test as part of device calibration / verification
RSCP		DUT support required. A common test as part of device calibration / verification

WCDMA Small Cell Base Station Tests

Standard Test	3GPP TS 25.141 Reference Paragraph	Notes
Maximum output power	6.2.1	
Primary CPICH power accuracy	6.2.2	
Frequency error	6.3.1	
Occupied BW	6.5.1	
Spectrum Emission Mask (SEM)	6.5.2.1	
ACLR	6.5.2.2	
Error Vector Magnitude (EVM)	6.7.1	
Peak Code Domain Error (PCDE)	6.7.2	
Reference sensitivity	7.2	DUT support required

GSM/EDGE Frequency Bands Supported

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)
GSM 450 band	460 MHz to 468 MHz	450 MHz to 458 MHz
GSM 480 band	488 MHz to 496 MHz	478 MHz to 486 MHz
GSM 750 band	747 MHz to 762 MHz	777 MHz to 792 MHz
GSM 850 band	869 MHz to 894 MHz	824 MHz to 849 MHz
R-GSM 900 band	921 MHz to 960 MHz	876 MHz to 915 MHz
DCS 1800 band	1805 MHz to 1880 MHz	1710 MHz to 1785 MHz
GSM 1900 band	1930 MHz to 1990 MHz	1850 MHz to 1910 MHz

GSM/EDGE Tests

Standard Test	3GPP TS 51.010-1 Reference Paragraph	Notes
TX output power	13.3, 13.17.3	
Transmit burst timing	13.3, 13.17.3	
Frequency error	13.1, 13.17.1	
Phase error	13.1, 13.17.1	
Error Vector Magnitude (8-PSK)	13.17.1	
Origin offset suppression	13.17.1	I/Q Mismatch, I/Q Offset
Output RF spectrum due to modulation (M-ORFS)	13.4, 13.17.4	
Output RF spectrum due to switching (S-ORFS)	13.4, 13.17.4	
Reference sensitivity	14.2	DUT support required
Usable input level range	14.3	DUT support required
RX level		DUT support required. A common test as part of device calibration / verification

TD-SCDMA Frequency Bands

Frequency Bands	Frequency Range
33	1900-1920 MHz
34	2010-2025 MHz
35	1850-1910 MHz
36	1930-1990 MHz
37	1910-1930 MHz
38	2570-2620 MHz
39	1880-1920 MHz
40	2300-2400 MHz

TD-SCDMA Tests

Standard Test	3GPP TS 34.122 Reference Paragraph	Notes
Maximum output power	5.2	
Power time mask	5.4.4	
Transmitter off power	5.4.4	
Modulation accuracy	5.7	
Occupied bandwidth	5.5.1	
Spectrum emission mask		
ACLR	5.5.2	
RX sensitivity	6.2	DUT support required
RX maximum input level	6.3	DUT support required
Throughput (single-ended)	9.3	DUT support required

cdma 2000 / 1xEV-DO Frequency Bands Supported

Band Class	Frequency Range (Generator)	Frequency Range (Analyzer)
0	860.025 MHz to 893.985 MHz	815.025 MHz to 848.985 MHz
1	1930.000 MHz to 1990.000 MHz	1850.000 MHz to 1910.000 MHz
2	917.0125 MHz to 959.9875 MHz	872.0125 MHz to 914.9875 MHz
3	1840.000 MHz to 1870.000 MHz	887.0125 MHz to 924.9875 MHz
4	421.675 MHz to 493.480 MHz	1750.000 MHz to 1780.000 MHz
5	421.675 MHz to 493.480 MHz	411.675 MHz to 483.480 MHz
6	2110.000 MHz to 2169.950 MHz	1920.000 MHz to 1979.950 MHz
7	746.000 MHz to 764.000 MHz	776.000 MHz to 794.000 MHz
8	1805.000 MHz to 1879.950 MHz	1710.000 MHz to 1784.950 MHz
9	925.000 MHz to 958.750 MHz	880.000 MHz to 913.750 MHz
10	851.000 MHz to 939.975 MHz	806.000 MHz to 900.975 MHz
11	421.675 MHz to 493.475 MHz	411.675 MHz to 483.475 MHz
12	915.0125 MHz to 920.9875 MHz	870.0125 MHz to 875.9875 MHz
13	2620.000 MHz to 2690.000 MHz	2500.000 MHz to 2570.000 MHz
14	1930.000 MHz to 1995.000 MHz	1850.000 MHz to 1915.000 MHz

Measurement	Frequency Range (Generator)	Frequency Range (Analyzer)
15	2110.000 MHz to 2155.000 MHz	1710.000 MHz to 1755.000 MHz
16	2624.000 MHz to 2690.000 MHz	2502.000 MHz to 2568.000 MHz
17	2624.000 MHz to 2690.000 MHz	

cdma2000 / 1xEV-DO Tests

Standard Test	Reference Paragraph		Notes
	C.S0011-C	C.S0033-B	
Maximum output power	4.4.5	4.3.4	
Frequency accuracy	4.3.4	4.2.2	
EVM			Available but not part of standards for cdma2000
Rho(p)	4.3.4	4.2.2	
Code domain power	4.3.5	4.3.8	
ACLR			Available but not part of standards for cdma2000. Faster than the Conducted Spurious Emissions Test.
Receiver sensitivity	3.5.1	3.3.1	DUT support required
RX dynamic range	3.5.1	3.3.1	DUT support required
RX level			DUT support required. A common test as part of device calibration / verification.

Navigation / Positioning Waveforms

IQxstream-M provides support for the downlink signals for the major location technologies, such as GPS, GLONASS, COMPASS, and Galileo. VSG waveforms can be used by the DUT to validate navigation functionality.

Wireless LAN (802.11 a/b/g/n/j/p) Measurement Specifications

Controls	Description	Performance
EVM (2.4 GHz band)	EVM averaged over payload based on standard requirements	
EVM (5 GHz band)	EVM averaged over payload based on standard requirements	
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.4 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)	Residual VSA I/Q imbalance: ≤ 1% (+20 to -35 dBm) Residual VSG I/Q imbalance: ≤ 1% (-5 to -70 dBm)
I/Q phase error	I/Q phase imbalance (degrees) and approximate contribution to EVM (dB)	Residual VSA I/Q imbalance: ≤ 0.5 degree (+20 to -35 dBm) Residual VSG I/Q imbalance: ≤ 0.5 degree (-5 to -70 dBm)
Frequency error	Carrier frequency error (kHz)	(For 802.11n packet at 16 symbols, EVM better than -25 dB) VSA measurement error: ≤ ± 0.2 ppm calibrated
RMS phase noise	Integrated phase noise (degrees)	VSA integrated phase noise: < TBD degrees (100 Hz to 1 MHz)
PSD	Power spectral density (dBm/Hz) versus frequency offset center frequency ± 20 MHz	
Spectral mask	Transmit spectrum mask	Spectral mask view: ± 20 MHz
Spectral flatness	Reflects variation of signal energy as a function of OFDM subcarrier number 802.11a/g/p/n/j OFDM signals only	VSA flatness over ≤ 40 MHz Ch BW: 1 dB (MAX – MIN)
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/p/n/j)	
	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/p/n/j/ac 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

Controls	Description	Performance
TX output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.4 dB (+20 to -35 dBm)
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: ± 0.4 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. 5 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)

Bluetooth (4.0) Measurement Specifications

Controls	Description	Performance
Output power at NOC[1]		VSA power accuracy: ± 0.4 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: ± 0.4 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: -15 to -120 dBm CW
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 supplied by LitePoint)
Note 3: IQxstream-M provides the wanted signal only.

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

IQxstream-M 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 (-50 to -100 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: -15 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) Measurement Specifications

Controls	Description	Performance
Output power	Transmit DUT output power (dBm)	VSA power accuracy: ± 0.4 dB (+20 to -35 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 Specifications

Controls	Description	Performance
Power	Normal Transmit Power	VSA power accuracy: ± 0.4 dB (+20 to -35 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	

MIMO System Performance

Controls	Performance
VSA capture trigger accuracy	≤ ± 3.5 ns
VSA start trigger accuracy	≤ ± 3.5 ns

General Purpose RF

Beyond the standards based testing IQxstream-M's Signal Generators and Vector Signal Analyzers provide you the ability to generate CW signals to a DUT and capture uplink signals for subsequent analysis. These tests can be performed over the full range of the tester's capabilities as defined in the General Specifications section.

When setting up the IQxstream for general purpose RF measurements the following controls are accessible.

Vector Signal Generator	Vector Signal Analyzer	
Frequency	Frequency	Trigger source
Output power level	Reference level (capture range)	Trigger level
Sample rate	Resolution bandwidth	Edge level
Marker Source	Capture length	
Waveform		

Beyond the ability to capture a waveform and export it for further analysis, IQxstream-M has the ability to make some basic measurements and provide displays to the operator as shown in the following table.

Test	Parameter	Notes
Power meter	Time domain filter bandwidth	Allow user selection of measurement windows from 10 kHz to 30 MHz
	Offset frequency	Allows power measurements to be offset within the capture band. This also supports multiple measurements from a single capture.
Power in band table		Displays power by user specified windows (up to 10) within the 30 MHz capture
Spectrum		Power vs. frequency for up to a 30 MHz capture
Power vs. Time		Display power vs. time. Useful in analysis of signals that exhibit burst behavior.

LITEPOINT