TECHNICAL SPECIFICATIONS

IQxstream-5G™

5G Sub-6 GHz Cellular Test System

LITEPOINT

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Port Descriptions

Front Panel

I/O	Function	Type
Power Switch	Power On/Off	Pushbutton Switch
RF1A/RF1B	Cellular, Wi-Fi, Bluetooth input/output	N female
RF2A/RF2B	Cellular, Wi-Fi, Bluetooth input/output	N female
RF3A/RF3B	Cellular, Wi-Fi, Bluetooth input/output	N female
RF4A/RF4B	Cellular, Wi-Fi, Bluetooth input/output	N female
Power Indicator	LED green – powered up, running LED orange – powered up, standby	LED indicator
Session 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 (A/B and C/D ports)	LED green – ports RF1 A/B are in one of the following status: • OFF/IN • IN/OFF • IN/IN LED orange – ports RF1 A/B are in one of the following status: • OUT/IN • IN/OUT LED red – ports RF1 A/B are in one of the following status: • OFF/OUT • OUT/OFF • OUT/OUT	LED indicator

RF port 2 indicator (for both A and B port)	LED green – ports RF2 A/B are in one of the following status: • OFF/IN • IN/OFF • IN/IN LED orange – ports RF2 A/B are in one of the following status: • OUT/IN • IN/OUT LED red – ports RF2 A/B are in one of the following status: • OFF/OUT • OUT/OFF • OUT/OUT	LED indicator
RF port 3 indicator (for both A and B port)	LED green – ports RF3 A/B are in one of the following status: • OFF/IN • IN/OFF • IN/IN LED orange – ports RF3 A/B are in one of the following status: • OUT/IN • IN/OUT LED red – ports RF3 A/B are in one of the following status: • OFF/OUT • OUT/OFF • OUT/OUT	LED indicator
RF port 4 indicator (for both A and B port)	LED green – ports RF4 A/B are in one of the following status: • OFF/IN • IN/OFF • IN/IN LED orange – ports RF4 A/B are in one of the following status: • OUT/IN • IN/OUT LED red – ports RF4 A/B are in one of the following status: • OFF/OUT • OUT/OFF • OUT/OUT	LED indicator
USB (2 ports)	USB 2.0 compatible connection to external controller	USB Type A

Rear Panel

I/O	Function	Type
10 MHz ref input	10 MHz reference input	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 240 VAC (automatically switched) 50 to 60 Hz, Includes hard power switch
DVI port	Display	DVI-D
VGA port	Display	VGA-15 pin
Communication I/O LAN	1000 Base-T LAN	RJ-45
GPIO	General purpose input/output	50-pin connector

General Technical Specifications

Vector Signal Analyzer (VSA) – Full Duplex Mode

Parameter	Value
Frequency Range	400 to 6000 MHz (TDD) 400 to 5100 MHz (FDD)
IF Bandwidth	200 MHz
Input Power	+34 dBm (avg) +36 dBm (peak)
Input Power Accuracy[1]	Specification for Input > -40 dBm: ± 0.5 dB 400 MHz – 3800 MHz ± 1 dB >3800 MHz – 6000 MHz Typical: ± 0.4 dB 400 MHz – 3800 MHz ± 0.5 dB >3800 MHz – 6000 MHz
Input return loss	17 dB, 400 to 3800 MHz, typical 14 dB, 3800 to 6000 MHz, typical
Spurious (signal applied)	< -52 dBc (CW, for signal levels greater than -20 dBm)
Spectral Flatness	Specification: ≤ ± 1 dB (± 100 MHz) Typical: ± 0.50 dB (± 100 MHz)
Inherent spurious floor (no signal)	RF1 to RF4 ≤ -80 dBm
Noise Figure	≤ 25 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
Sample data rates	10, 20, 30.72, 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 30.72 MHz sampling data rate: 3125 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 (Level or Edge)	-40 dBm
Absolute maximum value	Limited by the maximum input power	
Trigger relative threshold	Up to -40 dB below RLEV	
Level accuracy	± 2 dB	

Vector Signal Generator (VSG) – Full Duplex and Broadcast Modes

Parameter	Value	
Frequency Range	400 to 6000 MHz (TDD) 400 to 5100 MHz (FDD)	
IF Bandwidth	200 MHz	
Output Power Range (CW)	1 port active: +5 to -130 dBm (400 to 6000 MHz) All ports active: 0 to -130 dBm (≤ 4900 MHz) -10 to -130 dBm (> 4900 MHz)	
Output Power Accuracy[1]	Specifications and [Typical]: 1 port active ± 0.5 dB @ levels ≥ -50 dBm 400 MHz to <3800 MHz ± 1 dB [0.7 dB] @ levels ≥ -50 dBm 3800 MHz to 6000 MHz ± 0.75 dB @ -100 to < -50 dBm 400 MHz to 3800 MHz ± 1 dB @ -100 to < -50 dBm 3800 MHz to 6000MHz	
	Broadcast mode, all ports active ± 0.75 dB @ levels ≥ -50 dBm 600 MHz to <3800 MHz ± 1.25 dB [1 dB] @ levels ≥ -50 dBm 3800 MHz to 6000 MHz ± 1 dB @ -100 to < -50 dBm 600 MHz to 3800 MHz ± 1.5 dB @ -100 to < -50 dBm 3800 MHz to 6000MHz	
Output return loss	17 dB, 400 to 3800 MHz, typical 14 dB, 3800 to 6000 MHz, typical	
Spurious (in channel)	Specification:	≤ -40 dBc (200 MHz, >-55 dBm) (CW)
	Typical:	≤ -50 dBc (200 MHz, >-55 dBm) (CW)
Spurious (out of channel)	Out-of-band (> ± 100 MHz from carrier):	≤ -40 dBc (CW, excluding harmonics distortions)
Spectral Flatness	Specification:	± 1 dB (± 100 MHz)
	Typical:	± 0.50 dB (± 100 MHz)
Integrated Phase Noise (TDD Mode)	≤ 0.3 degrees (100 Hz to 1 MHz)	
Integrated Phase Noise (FDD mode)	≤ 0.4 degrees (100 Hz to 1 MHz)	
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 Power > -50 dBm	
Sampling data rate	10, 20, 30.72, 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 30.72 MHz sampling data rate: 3125 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	

1 Specifications valid from 20°C to 30°C. Temperature compensation enables the typical performance and operation up to 35°C.

Port Isolation

Measurement	Value
Port to Port Isolation	VSA-to-VSA: 100 dB, <2500 MHz, typical 90 dB, >2500 MHz, typical VSG-to-VSG: 90 dB, <2500 MHz, typical 80 dB, >2500 MHz, typical VSG-to-VSA: 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 0°C to 50°C range, referenced to 25°C
Warm-up time (to within ±0.1 ppm at 25°C)	> 30 minutes

General and Environmental

Dimensions	14.5" W x 3.2" H x 20.5" D (368 mm x 82 mm x 521 mm)
Weight	26 lbs (11.8 kg)
Power consumption (maximum)	200W
Power consumption (average)	150 W
Power requirements	100 - 240 VAC, 50-60 Hz
Supported browsers	Google Chrome, Mozilla Firefox
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	20°C to 35°C, 60 minutes warm-up time at ambient temperature
Operating humidity	15% to 95% relative humidity, non-condensing (IEC EN60068-2-30)
EMC	EN61326-1 Class A, EN55011
EMI (Immunity)	EN 61000-4
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	8 in-lbs (90 N-cm)
Recommended calibration cycle	12 months
Warranty	12 months hardware, 12 months software updates

Wireless Standards Support

The IQxstream-5G 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, the IQxstream-5G 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-5G user documentation.

IQxstream-5G supports a continuous frequency range between 400 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-5G fundamentally measures power. If you can set the DUT to the particular state, IQxstream-5G 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-5G capabilities. It only describes a minimum feature set included with the tester. IQxstream-5G can do far more, and perhaps more importantly, can have specific capabilities added to it via software updates to meet application-specific needs.

5G Frequency Bands Supported

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
n1	2110 MHz to 2170 MHz	1920 MHz to 1980 MHz	FDD
n2	1930 MHz to 1990 MHz	1850 MHz to 1910 MHz	FDD
n3	1805 MHz to 1880 MHz	1710 MHz to 1785 MHz	FDD
n5	869 MHz to 894 MHz	824 MHz to 849 MHz	FDD
n7	2620 MHz to 2690 MHz	2500 MHz to 2570 MHz	FDD
n8	925 MHz to 960 MHz	880 MHz to 915 MHz	FDD
n12	729 MHz to 746 MHz	699 MHz to 716 MHz	FDD
n20	791 MHz to 821 MHz	832 MHz to 862 MHz	FDD
n25	1930 MHz to 1995 MHz	1850 MHz to 1915 MHz	FDD
n28	758 MHz to 803 MHz	703 MHz to 748 MHz	FDD
n34	2010 MHz to 2025 MHz	2010 MHz to 2025 MHz	TDD
n38	2570 MHz to 2620 MHz	2570 MHz to 2620 MHz	TDD
n39	1880 MHz to 1920 MHz	1880 MHz to 1920 MHz	TDD
n40	2300 MHz to 2400 MHz	2300 MHz to 2400 MHz	TDD
n41	2496 MHz to 2690 MHz	2496 MHz to 2690 MHz	TDD
n50	1432 MHz to 1517 MHz	1432 MHz to 1517 MHz	TDD
n51	1427 MHz to 1432 MHz	1427 MHz to 1432 MHz	TDD

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
n65	2110 MHz to 2200 MHz	1920 MHz to 2010 MHz	FDD
n66	2110 MHz to 2200 MHz	1710 MHz to 1780 MHz	FDD
n70	1995 MHz to 2020 MHz	1695 MHz to 1710 MHz	FDD
n71	617 MHz to 652 MHz	663 MHz to 698 MHz	FDD
n74	1475 MHz to 1518 MHz	1427 MHz to 1470 MHz	FDD
n75	1432 MHz to 1517 MHz	Downlink Only	SDL
n76	1427 MHz to 1432 MHz	Downlink Only	SDL
n77	3300 MHz to 4200 MHz	3300 MHz to 4200 MHz	TDD
n78	3300 MHz to 3800 MHz	3300 MHz to 3800 MHz	TDD
n79	4400 MHz to 5000 MHz	4400 MHz to 5000 MHz	TDD
n80	Uplink Only	1710 MHz to 1785 MHz	SUL
n81	Uplink Only	880 MHz to 915 MHz	SUL
n82	Uplink Only	832 MHz to 862 MHz	SUL
n83	Uplink Only	703 MHz to 748 MHz	SUL
n84	Uplink Only	1920 MHz to 1980 MHz	SUL
n86	Uplink Only	1710 MHz to 1780 MHz	SUL

5G Measurement Specifications

3GPP TS 38.101-1	Paragraph Reference	Notes
Transmit Power	6.2	Maximum Power
Output Power Dynamics	6.3	Min Power Relative Power On/Off Time Mask
Transmit Signal Quality	6.4	Frequency Error EVM: -45 dB Typical (Tx-Rx loopback at 100 MHz CC, 3.5 GHz, MCS14, -10 dBm transmit power level) Carrier Leakage In-band Emissions
Output RF Spectrum Emissions	6.5	Occupied Bandwidth Spectrum Emission Mask ACLR

Receiver Sensitivity	7.3	Reference Sensitivity Power
Receiver Level	7.4	Maximum Input Level
Receiver Blocking	7.5	Adjacent Channel Selectivity (Characterization only, not recommended for manufacturing)
	7.6	In-band Blocking (Requires DUT support)

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
6	875 MHz to 885 MHz	830 MHz to 840 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	1844.9 MHz to 1879.9 MHz	1749.9 MHz to 1784.9 MHz	FDD
10	2110 MHz to 2170 MHz	1710 MHz to 1770 MHz	FDD
11	1475.9 MHz to 1495.9 MHz	1427.9 MHz to 1447.9 MHz	FDD
12	729 MHz to 746 MHz	699 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
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

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
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	Dowlink Only	DL
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
32	1452 MHz to 1496 MHz	Downlink Only	DL
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
45	1447 MHz to 1467 MHz	1447 MHz to 1467 MHz	TDD
46	5150 MHz to 5925 MHz	5150 MHz to 5925 MHz	TDD
47	5855 MHz to 5925 MHz	5855 MHz to 5925 MHz	TDD
48	3550 MHz to 3700 MHz	3550 MHz to 3700 MHz	TDD
49	3550 MHz to 3700 MHz	3550 MHz to 3700 MHz	TDD
50	1432 MHz to 1517 MHz	1432 MHz to 1517 MHz	TDD
51	1427 MHz to 1432 MHz	1427 MHz to 1432 MHz	TDD
52	3300 MHz to 3400 MHz	3300 MHz to 3400 MHz	TDD
53	2483.35 MHz to 2494.85 MHz	2483.35 MHz to 2494.85 MHz	TDD
65	2110 MHz to 2200 MHz	1920 MHz to 2010 MHz	FDD
66	2110 MHz to 2200 MHz	1710 MHz to 1780 MHz	FDD
67	738 MHz to 758 MHz	Downlink Only	DL

Frequency Bands	Frequency Range (Generator)	Frequency Range (Analyzer)	Duplex Mode
68	753 MHz to 783 MHz	698 MHz to 728 MHz	FDD
69	2570 MHz to 2620 MHz	Downlink Only	DL
70	1995 MHz to 2020 MHz	1695 MHz to 1710 MHz	FDD
71	617 MHz to 652 MHz	663 MHz to 698 MHz	FDD
72	461 MHz to 466 MHz	451 MHz to 456 MHz	FDD
73	460 MHz to 465 MHz	450 MHz to 455 MHz	FDD
74	1475 MHz to 1518 MHz	1427 MHz to 1470 MHz	FDD
75	1432 MHz to 1517 MHz	Downlink Only	DL
76	1427 MHz to 1432 MHz	Downlink Only	DL
85	728 MHz to 746 MHz	698 MHz to 716 MHz	FDD
252	5150 MHz to 5250 MHz	5150 MHz to 5250 MHz	LAA / LTE-U
255	5725 MHz to 5850 MHz	5725 MHz to 5850 MHz	LAA / LTE-U

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	

Standard Test	3GPP TS 36.521-1 Reference Paragraph	Notes
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 36.141 Reference Paragraph	Notes
Home BS output power	6.2.1	
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

Measurement		Performance
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

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

Measurement	Frequency Range (Generator)	Frequency Range (Analyzer)
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
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.

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

Measurement	Description	Performance
EVM	EVM averaged over payload based on standard requirements (Typical)	Residual loopback EVM (preamble only channel estimation): ≤ -46 dB (-5 to -15 dBm) 2.4 GHz frequency band 802.11ax waveform, 40 MHz, MCS 11 ≤ -46 dB (-8 to -15 dBm) Measured at 5755 MHz 802.11ax waveform, 80 MHz, MCS 11 Averaged over 20 packets
Peak power	Peak power over all symbols (dBm)	VSA power accuracy: ± 0.5 dB (400 MHz – 3800 MHz), ± 1 dB (>3800 MHz – 6000 MHz)
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 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	

802.11ax (Wi-Fi 6) Waveform Generation

Feature	Specification
PPDU format	HE-SU, HE-MU, HE-EXT-SU (extended range), HE-TRIG (trigger based)
Bandwidth	20 MHz, 40 MHz, 80 MHz, 160 MHz, 80 + 80 MHz
Modulation	BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM, 1024-QAM, 4096-QAM
OFDMA	HE-MU (Downlink), HE-TRIG PPDU (Uplink)
MU MIMO	Downlink, Uplink, up to 8 users
HE PPDU configuration	HE-LTF, GI time, SIG-A, SIG-B
DCM (Dual Carrier Modulation)	On, Off
Coding type	LDPC, BCC
HE-MU PPDU configuration	Per RU configuration: Station ID, size, user number, index, segment, power boost factor, MCS index, spatial mapping
Trigger Frame configuration	Per RU configuration: index, RU allocation, MCS index, target RSSI
HE-TRIG based PPDU	Per RU configuration: size, user number, index, MCS index, spatial mapping

802.11ax (Wi-Fi 6) Waveform Analysis

Feature	Specification
PPDU format	HE-SU, HE-MU, HE-EXT-SU (extended range), HE-TRIG (trigger based)
TX Quality Info	PSDU analysis and decode including HE-LTF, GI time, SIG-A, SIG-B and CRC, user number, RU index, size, MCS index
Downlink OFDMA & MU-MIMO analysis	Per User/RU composite and individual EVM and Power results
Uplink HE-TRIG PPDU & MU-MIMO analysis	Per User/RU composite and individual EVM and Power results including EVM of unoccupied tones
Trigger Frame analysis	Decode of common info fields and user info fields
Trigger Based Test	Dual ended test designed to verify STA and AP compliance for HE-TRIG PPDU: Downlink transmission of Trigger frame with configurable index, RU allocation, MCS index, target RSSI Uplink analysis of STA Carrier Frequency Offset (CFO) in the HE-TRIG PPDU per user/RU Uplink analysis of time offset between the trigger frame and the STA HE-TRIG PPDU per user/RU

MIMO System Performance

The additional specifications in the table below apply to the complete IQxstream-5G 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

For performance refer to general VSA/VSG hardware specifications

Measurement	Description	Performance
TX output power	Transmit DUT output power (dBm)	
TX output spectrum	Transmit DUT power spectral density	
20 dB bandwidth	Bandwidth between the ± 20 dB down points of the modulation waveform	
In-band emissions (Adjacent channel)	Spurious emission measured at ± 5 MHz of DUT TX frequency only	
Modulation characteristics	Average and peak frequency deviation (Hz)	
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)	
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.	
Maximum input signal level	Assuming single-ended BER measurement	
RMS EVM (EDR)	RMS EVM for Bluetooth EDR	
Peak EVM (EDR)	Peak EVM for Bluetooth EDR	

1 IQxstream-5G supports testing sensitivity with Dirty Packets

Bluetooth (4.0, 4.1, 4.2) Measurement Specifications

For performance refer to general VSA/VSG hardware specifications

Measurement	Description
Output power at NOC[1]	
Output power at EOC[1]	
In-band emissions at NOC[1]	Spurious emission measured at ± 5 MHz of DUT TX frequency only
In-band emissions at EOC[1]	
Modulation characteristics	Average and peak frequency deviation (Hz)
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
Receiver sensitivity at EOC[1,2]	
C/I and receiver selectivity performance[3]	
Blocking performance[3]	
Intermodulation performance	
Maximum input signal level	Assuming single-ended BER measurement
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 IQxstream-5G provides the wanted signal only. No interfering signal is available

Bluetooth 5 Measurement Specifications

For performance refer to general VSA/VSG hardware specifications

Measurement	Description
In-band emissions	Spurious emission measured at ± 5 MHz of DUT TX frequency only. Tested at 1 Mbps, 2 Mbps
Modulation Characteristics	Average and peak frequency deviation (Hz). Tested at 1 Mbps, 2 Mbps, 125 kbps
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
Receiver Sensitivity	Receive sensitivity test using LitePoint or user-generated waveforms. Tested at 1 Mbps, 2 Mbps, 125 kbps
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
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
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

Bluetooth 5.1 Measurement Specifications

For performance refer to general VSA/VSG hardware specifications

Measurement	Description
Output Power, with Constant Tone Extension	Verifies maximum peak and average power emitted when transmitting with a Constant Tone Extension.
Carrier Frequency offset and drift, with Constant Tone Extension	Verifies carrier frequency offset and carrier drift of the transmitted Constant Tone Extension portion in a transmitted signal with a Constant Tone Extension. Tested at 1 Mbps, 2 Mbps
IQ Samples Coherency, AoD Receiver	Verifies relative phase values derived from the I/Q values sampled at AoD Receiver from a Constant Tone Extension. Tested at 1 Mbps, 2 Mbps, 1 µs Slot, 2 µs Slot
IQ Samples Coherency, AoA Receiver[1]	Verifies relative phase values derived from the I/Q values sampled at AoD Receiver from a Constant Tone Extension. Tested at 1 Mbps, 2 Mbps, 2 µs Slot
IQ Samples Dynamic Range, AoD Receiver	Verifies the I/Q values sampled at AoD Receiver when varying the dynamic range of the Constant Tone Extension. Tested at 1 Mbps, 2 Mbps, 1 µs Slot, 2 µs Slot
IQ Samples Dynamic Range, AoA Receiver[1]	Verifies the I/Q values sampled at AoA Receiver when varying the dynamic range of the Constant Tone Extension. Tested at 1 Mbps, 2 Mbps, 2 µs Slot

1 Test requires an external splitter

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

Measurement	Description
Output power	Transmit DUT output power (dBm)
Power spectral density	Transmit DUT power spectral density
Center Frequency Tolerance	Tx center frequency tolerance
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
Power	Normal Transmit Power
Power vs. time	Power time template
Frequency offset	Frequency offset
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: L1, L2, L5 GLONASS: 1598 to 1606 MHz COMPASS: 1561.098 (+/- 2.046) MHz Galileo: 1559 to 1593 MHz
Number of simultaneous channels	1
Output power range	-60 to -130 dBm
Level accuracy	± 0.75 dB

1 Navigation is a standard feature included with general purpose RF function

Order Codes

Code	Product
0100-XS5G-001	IQxstream-5G Test System, 8-port. 400 to 6000 MHz RF. Includes General Purpose RF Measurement Toolbox with browser-based Graphical User Interface (GUI) and 1 year hardware warranty
0100-XS5G-003	IQxstream-5G+ Test System, 8-port. 400 to 6000 MHz RF. Includes General Purpose RF Measurement Toolbox with borwser-based Graphical User Interface (GUI) and 1 year hardware warranty
0300-XS5G-001	3GPP NR 5G Software License
0300-XS5G-005	LTE Measurement Suite Software License. Includes LTE FDD and LTE TDD.
0300-XS5G-007	LTE-Advanced Pro Measurement Suite Software License. Enables LTE release 12 & 13 measurement features.
0300-XS5G-009	UMTS Measurement Suite Software License. Includes GSM / EDGE, W-CDMA / HSPA, W-CDMA / HSPA+.
0300-XS5G-011	CDMA 2000 Measurement Suite Software License. Includes cdmaOne, EV-DO Rev 0, Rev A, Rev B.
0300-XS5G-013	TD-SCDMA Measurement Suite Software License.
Others	Contact LitePoint for Wi-Fi/NB-IoT/BT/ZigBee/Navigational order codes

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