



FCC RF Test Report

Product Name: LTE CPE

Model Number: E5172s-515

Report No: SYBH(Z-RF)031042013-2002

FCC ID: QISE5172S-515

Reliability Laboratory of Huawei Technologies Co., Ltd.

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Notice

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2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.
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Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
 Bantian, Longgang District, Shenzhen, 518129, P.R.C

Date of Receipt Sample: 2013-05-02
Start Date of Test: 2013-05-04
End Date of Test: 2013-06-16

Test Result: Pass

Approved by Senior Engineer:	2013-06-24	Dai Linjun	
	Date	Name	Signature

Prepared by:	2013-06-24	Zhu Mingjing	
	Date	Name	Signature



Modification Record

No.	Last Report No.	Modification Description
1	---	First report.



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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J 2012
47 CFR FCC Part 15, Subpart C 2012

Test Method: FCC KDB 558074 D01 DTS Meas Guidance v03r01
FCC KDB 662911 D01 Multiple Transmitter Output v01r2

1.2 Test Location

Test Location 1: Reliability Laboratory of Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.3 Test Environment Condition

Ambient Temperature: 19.5to 25 °C
Ambient Relative Humidity: 40 to 55 %
Atmospheric Pressure: Not applicable



2 Test Summary

Test Item	FCC Part No.	Requirements	Test Result	Verdict (NOTE 2)
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	Appendix A	Pass
Occupied Bandwidth (Only for IC requirement)		No limit.		--
Maximum Peak Conducted Output Power	15.247(b)(3)	For directional gain: < 30 dBm – (G[dBi] – 6 [dB]), peak; Otherwise: < 30 dBm, peak.	Appendix B	Pass
Maximum Power Spectral Density Level	15.247(e)	For directional gain: < 8 dBm/3 kHz – (G[dBi] – 6 [dB]), peak. Otherwise: < 8 dBm/3 kHz, peak.	Appendix C	Pass
Band Edges Compliance	15.247(d)	< -20 dBm/100 kHz if total peak power ≤ power limit.	Appendix D	Pass
Unwanted Emissions into Non-Restricted Frequency Bands			Appendix E	Pass
Unwanted Emissions into Restricted Frequency Bands (Radiated)	15.247(d) 15.209 (NOTE 1)	FCC Part 15.209 field strength limit;	Appendix F	Pass
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	Appendix G	Pass
NOTE 1: According to KDB 558074, antenna-port conducted measurements are acceptable as an alternative to radiated measurements for demonstrating compliance to the limits in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case emissions will also be required.				
NOTE 2: For the verdict, the “N/A” denotes “not applicable”, the “N/T” denotes “not tested”.				



3 Description of the Equipment under Test (EUT)

3.1 General Description

E5172s-515 LTE/WCDMA/GSM three mode 9 bands CPE is subscriber equipment in the LTE/UMTS/GSM system and support Wi-Fi 802.11b/g/n. E5172s-515 implement such functions as RF signal receiving/transmitting, LTE/WCDMA/GSM protocol processing, data service etc. Externally it provides USIM card interface, RJ45 Ethernet interface and RJ11 telephone interface. E5172s-515 has one external antenna and four internal antennas. Two internal antennas are used for WiFi, while the external antenna and other two internal antennas are used for LTE/WCDMA/GSM. For the LTE/WCDMA/GSM internal antennas, only one was used for transmission and both for reception.

3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Board

Board		
Serial Number	Hardware Version	Description
054995FC34000109	CL2E5172R	Router Board
	CL1E5172M	Modem Board

3.2.2 Sub-Assembly

Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HW-120200U1W	Huawei Technologies Co., Ltd.	Input: 100Vac~240Vac, 50/60Hz, 0.8A Output: 12.0V, 2.0A Rated Power: 24W
Adapter	HW-120200U6W	Huawei Technologies Co., Ltd.	Input: 100Vac~240Vac, 50/60Hz, 0.8A Output: 12.0V, 2.0A Rated Power: 24W
Battery(optional)	---	Huawei Technologies Co., Ltd.	Rechargeable battery,Nickel Metal Hydride Battery,3.6V,1.5Ah,Battery Pack



3.3 Technical Description

Characteristics	Description		
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11b (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11g (20 MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11n (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11n (40 MHz channel bandwidth)		
TX/RX Operating Range	2412-2462 MHz band	fc = 2407 MHz + N * 5 MHz, where: - fc = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.	
Data Rate	802.11b	1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps	
	802.11g	6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps	
	802.11n (SISO)	MCS 0 to MCS 7	
	802.11n (MIMO)	MCS 8 to MCS 15	
Modulation Type	DBPSK/DQPSK/CCK (DSSS), BPSK/QPSK/16QAM/64QAM (OFDM).		
Emission Designator	8M62G1D (for 802.11b mode), 16M6G7D (for 802.11g mod), 17M8G7D (for 802.11n mode) 36M4G7D (for 802.11n(40M) mode)		
TX Power Control	<input checked="" type="checkbox"/> Supported, <input type="checkbox"/> Not Supported		
Standby Mode	<input type="checkbox"/> Supported, <input checked="" type="checkbox"/> Not Supported		
Equipment Type	<input type="checkbox"/> Stand-alone equipment, <input type="checkbox"/> Plug-in radio device, <input checked="" type="checkbox"/> Combined equipment		
Antenna	Description	Isotropic Antenna,2400~2500MHz isotropic,5W,N-J,no	
	Type	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated	
	Ports	<input checked="" type="checkbox"/> Ant 1, <input checked="" type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3	
	Smart System	<input checked="" type="checkbox"/> SISO (for 802.11b/g/n), <input checked="" type="checkbox"/> MIMO (for 802.11n): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11b/g) : Tx & Rx	
	Gain	Ant 1: 2 dBi (per antenna port, max.) Ant 2: 2 dBi (per antenna port, max.)	
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.	
Power Supply	Type	<input checked="" type="checkbox"/> AC/DC Adapter	<input type="checkbox"/> PoE: <input type="checkbox"/> Other:



4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: Typical working modes for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
11B	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
11G	IEEE 802.11g with data rate of 6 Mbps using SISO mode.
11N20	IEEE 802.11n with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11N20m	IEEE 802.11n with data rate of MCS8 and bandwidth of 20 MHz using MIMO mode.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 40 MHz using SISO mode.
11N40m	IEEE 802.11n with data rate of MCS8 and bandwidth of 40 MHz using MIMO mode.
11x_RX	Continues Receiving mode (if supported).



4.2 EUT Configurations

4.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, - All TX tests are performed at all TX antenna ports of the EUT, and - All RX tests are performed at all RX antenna ports of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

4.2.2 Customized Configurations

Test Mode	RF Ch.	TX Freq. [MHz]	Antenna Port	RX Freq. [MHz]	Ch. BW [MHz]	Power Conf., per Port
11B	L	Ch No. 1 / 2412 MHz	Ant1	---	20	15
			Ant2	---	20	15
	M	Ch No. 6 / 2437 MHz	Ant1	---	20	15
			Ant2	---	20	15
	H	Ch No. 11 / 2462 MHz	Ant1	---	20	15
			Ant2	---	20	15
11G	L	Ch No. 1 / 2412 MHz	Ant1	---	20	13
			Ant2	---	20	13
	M	Ch No. 6 / 2437 MHz	Ant1	---	20	13
			Ant2	---	20	13
	H	Ch No. 11 / 2462 MHz	Ant1	---	20	13
			Ant2	---	20	13
11N20	L	Ch No. 1 / 2412 MHz	Ant1	---	20	12
			Ant2	---	20	12
	M	Ch No. 6 / 2437 MHz	Ant1	---	20	12
			Ant2	---	20	12
	H	Ch No. 11 / 2462 MHz	Ant1	---	20	12
			Ant2	---	20	12
11N20m	L	Ch No. 1 / 2412 MHz	Ant1	---	20	12
			Ant2	---	20	12
	M	Ch No. 6 / 2437 MHz	Ant1	---	20	12
			Ant2	---	20	12
	H	Ch No. 11 / 2462 MHz	Ant1	---	20	12
			Ant2	---	20	12
11N40	L	Ch No. 3 / 2422 MHz	Ant1	---	40	12
			Ant2	---	40	12



Test Mode	RF Ch.	TX Freq. [MHz]	Antenna Port	RX Freq. [MHz]	Ch. BW [MHz]	Power Conf., per Port
	M	Ch No. 6 / 2437 MHz	Ant1	---	40	12
			Ant2	---	40	12
	H	Ch No. 9 / 2452 MHz	Ant1	---	40	12
			Ant2	---	40	12
11N40m	L	Ch No. 3 / 2422 MHz	Ant1	---	40	12
			Ant2	---	40	12
	M	Ch No. 6 / 2437 MHz	Ant1	---	40	12
			Ant2	---	40	12
	H	Ch No. 9 / 2452 MHz	Ant1	---	40	12
			Ant2	---	40	12

4.3 Test Environments

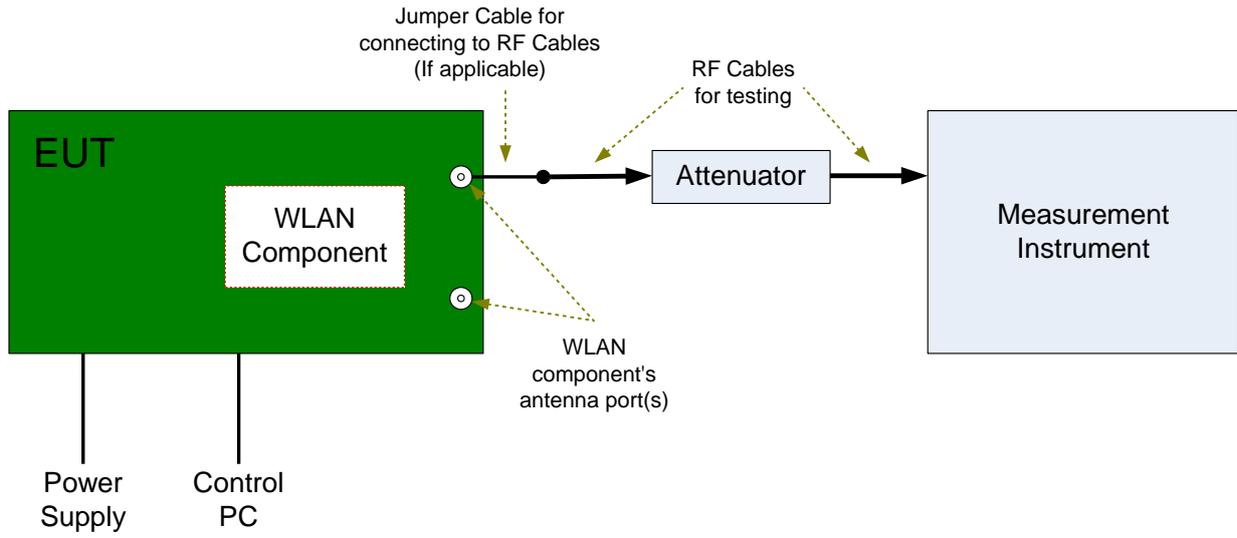
NOTE: The values used in the test report may be stringent than the declared.

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	Ambient	3.6 VDC	Ambient

4.4 Test Setups

4.4.1 Test Setup 1

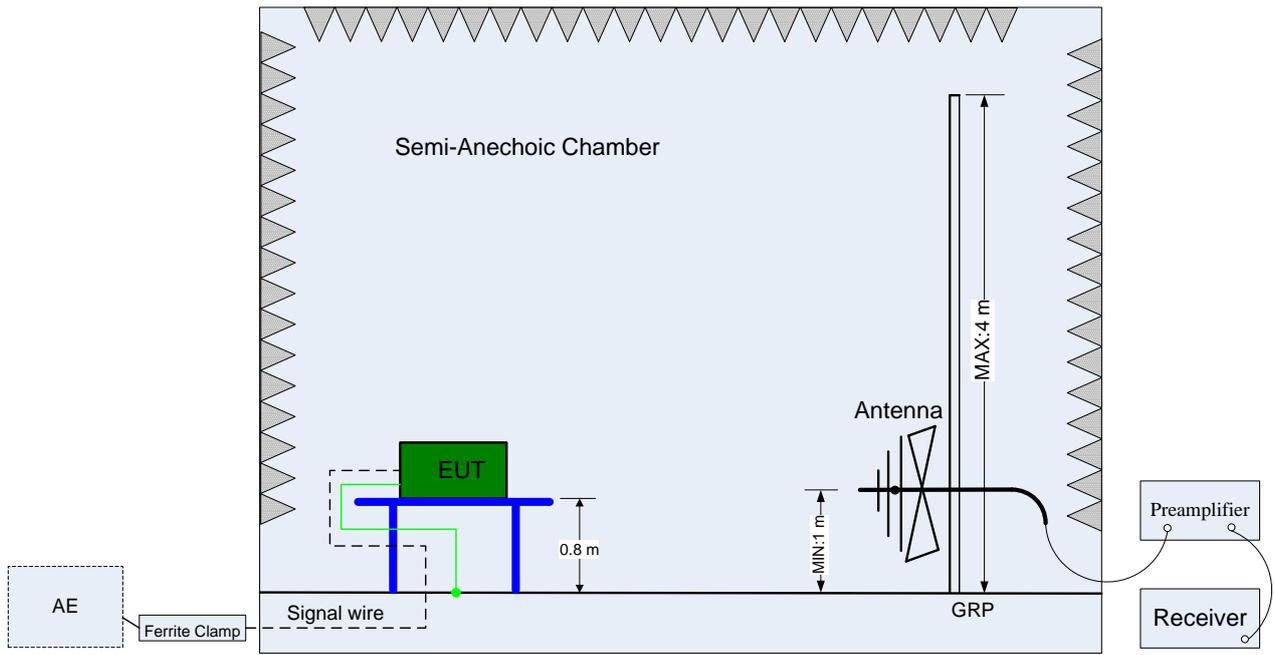
The WLAN component's antenna port(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



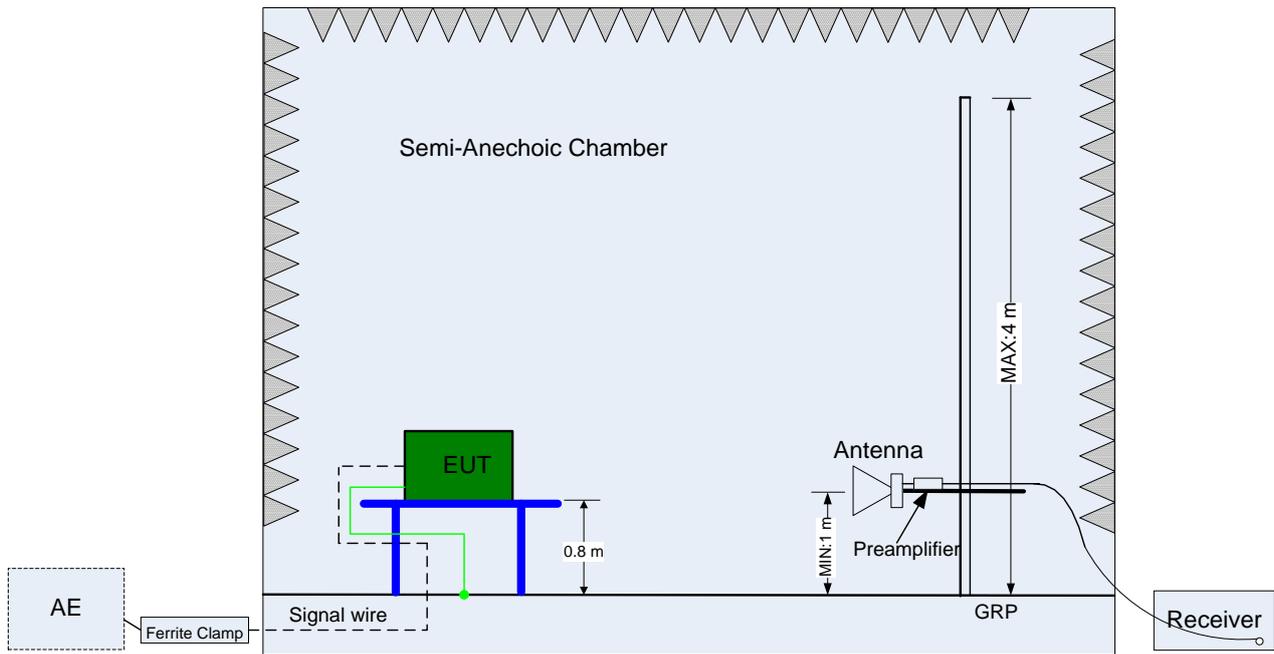
4.4.2 Test Setup 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4. The test distance is 3m. The setup is according to ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).



(Below 1 GHz)

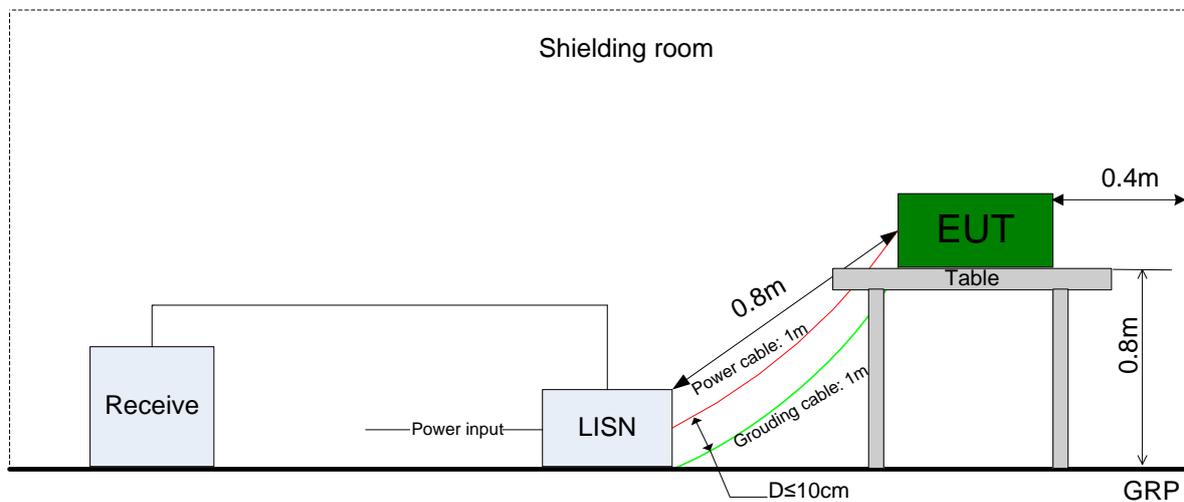


(Above 1 GHz)

4.4.3 Test Setup 3

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.



4.5 Test Conditions

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1 , 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 , 11N20_L@Ant1 , 11N20_M@Ant1, 11N20_H@Ant1 , 11N20m_L@Ant1, 11N20m_L@Ant2, 11N20m_M@Ant1, 11N20m_M@Ant2, 11N20m_H@Ant1, 11N20m_H@Ant2, 11N40_L@Ant1, 11N40_M@Ant1 , 11N40_H@Ant1, 11N40m_L@Ant1, 11N40m_L@Ant2, 11N40m_M@Ant1, 11N40m_M@Ant2, 11N40m_H@Ant1, 11N40m_H@Ant2,
Maximum Peak Conducted Output Power	Measurement Method	FCC KDB 558074 §9.1 .2 (integrated band power method).
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1, 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1 11N20_L@Ant1, 11N20_M@Ant1, 11N20_H@Ant1, 11N20m_L@Ant1, 11N20m_L@Ant2, 11N20m_M@Ant1, 11N20m_M@Ant2, 11N20m_H@Ant1, 11N20m_H@Ant2, 11N40_L@Ant1, 11N40_M@Ant1, 11N40_H@Ant1, 11N40m_L@Ant1, 11N40m_L@Ant2, 11N40m_M@Ant1, 11N40m_M@Ant2, 11N40m_H@Ant1, 11N40m_H@Ant2,
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.2 (peak PSD).
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_M@Ant1, 11B_H@Ant1, 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1, 11N20_L@Ant1, 11N20_M@Ant1, 11N20_H@Ant1, 11N20m_L@Ant1, 11N20m_L@Ant2, 11N20m_M@Ant1, 11N20m_M@Ant2, 11N20m_H@Ant1, 11N20m_H@Ant2, 11N40_L@Ant1, 11N40_M@Ant1, 11N40_H@Ant1, 11N40m_L@Ant1, 11N40m_L@Ant2, 11N40m_M@Ant1, 11N40m_M@Ant2, 11N40m_H@Ant1, 11N40m_H@Ant2,
Band Edges Compliance	Measurement Method	FCC KDB 558074 §13.0.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1, 11B_H@Ant1, 11G_L@Ant1, 11G_H@Ant1,



Test Case	Test Conditions	
	Configuration	Description
		11N20_L@Ant1, 11N20_H@Ant1, 11N20m_L@Ant1,11N20m_L@Ant2,11N20m_H@Ant1,11N20m_H@Ant2, 11N40_L@Ant1, 11N40_H@Ant1, 11N40m_L@Ant1,11N40m_L@Ant2,11N40m_H@Ant1,11N40m_H@Ant2,
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074 §11.0
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L@Ant1,11B_M@Ant1, 11B_H@Ant1, 11G_L@Ant1, 11G_M@Ant1, 11G_H@Ant1, 11N20_L@Ant1, 11N20_M@Ant1, 11N20_H@Ant1, 11N20m_L@Ant1,11N20m_L@Ant2,11N20m_M@Ant1, 11N20m_M@Ant2, 11N20m_H@Ant1, 11N20m_H@Ant2, 11N40_L@Ant1, 11N40_M@Ant1, 11N40_H@Ant1, 11N40m_L@Ant1, 11N40m_L@Ant2, 11N40m_M@Ant1, 11N40m_M@Ant2, 11N40m_H@Ant1, 11N40m_H@Ant2,
Unwanted Emissions into Restricted Frequency Bands (Radiated)	Measurement Method	ANSI C63.10; FCC KDB 558074 §12.1, Radiated
	Test Environment	NTNV
	Test Setup	Test Setup 2
	EUT Placement	<input checked="" type="checkbox"/> Flatwise, <input checked="" type="checkbox"/> Upright, <input checked="" type="checkbox"/> Hung
	EUT Configuration	(1) 30 MHz to 1 GHz: 11B_L@Ant1 (Worst Conf.). (2) 2.3 GHz to 2.51 GHz: 11B_L@Ant1, 11B_H@Ant1, 11B_L@Ant2, 11B_H@Ant2, 11G_L@Ant1, 11G_H@Ant1, 11G_L@Ant2, 11G_H@Ant2, 11N20_L@Ant1, 11N20_H@Ant1, 11N20_L@Ant2, 11N20_H@Ant2, 11N20m_L@Ant1,11N20m_L@Ant2,11N20m_H@Ant1, 11N20m_H@Ant2, 11N40_L@Ant1, 11N40_H@Ant1, 11N40_L@Ant2, 11N40_H@Ant2, 11N40m_L@Ant1,11N40m_L@Ant2,11N40m_H@Ant1, 11N40m_H@Ant2, (3) 1 GHz to 18 GHz: 11B_L@Ant1 (Worse Conf.) (4) 18 GHz to 26.5 GHz: 11B_L@Ant1 (Worse Conf.)
AC Power Line	Measurement Method	AC mains conducted.



Test Case	Test Conditions	
	Configuration	Description
Conducted Emissions	Test Environment	NTNV
	Test Setup	Test Setup 3
	EUT Configuration	11B_M@Ant1 (Worst Conf.).



5 Main Test Instruments

Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal- Due
Power supply	KEITHLEY	2303	1288003	2012-11-19	2014-11-18
Spectrum Analyzer	Agilent	E4440A	MY48250119	2012-08-20	2013-08-19
Signal Analyzer	R&S	FSQ31	200021	2012-11-09	2013-11-08
Spectrum Analyzer	Agilent	N9030A	MY49431698	2012-11-09	2013-11-08
Temperature Chamber	WEISS	WKL64	56246002940010	2013-01-29	2014-01-28
Signal generator	Agilent	E8257D	MY49281095	2012-09-14	2013-09-13
Spectrum analyzer	R&S	FSU3	200474	2013-01-29	2014-01-28
Spectrum analyzer	R&S	FSU43	100144	2013-01-29	2014-01-28
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	2013-02-02	2014-02-01
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	2011-10-12	2013-10-11
Trilog Broadband Antenna (30M~3GHz)	SCHWARZB ECK	VULB 9163	9163-521	2011-12-09	2013-12-08
Pyramidal Horn Antenna(18GHz-26-5GHz)	ETS-Lindgren	3160-09	00091989	2011-10-20	2013-10-19

END