

RF TEST REPORT



Report No.: 15070769-FCC-R3

Supersede Report No.: N/A

Applicant	Verykool USA Inc	
Product Name	Mobile Phone	
Model No.	s5001	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2013	
Test Date	September 02 to September 23, 2015	
Issue Date	October 08, 2015	
Test Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
Equipment complied with the specification <input checked="" type="checkbox"/>		
Equipment did not comply with the specification <input type="checkbox"/>		
<i>Winnie Zhang</i>	<i>David Huang</i>	
Winnie Zhang Test Engineer	David Huang Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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Laboratories Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



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Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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1. Report Revision History

Report No.	Report Version	Description	Issue Date
15070769-FCC-R3	NONE	Original	October 08, 2015

2. Customer information

Applicant Name	Verykool USA Inc
Applicant Add	3636 Nobel Drive, Suite 325, San Diego, CA 92122 USA
Manufacturer	HUAWO TECHNOLOGY LIMITED
Manufacturer Add	9A,Gongkan building,Technology south 8th road,High-Tech Park,Nanshan district,Shenzhen

3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	718246
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

4. Equipment under Test (EUT) Information

Description of EUT: Mobile Phone

Main Model: s5001

Serial Model: N/A

Date EUT received: September 01, 2015

Test Date(s): September 02 to September 23, 2015

Equipment Category : DTS

Antenna Gain:	GSM850: -3.9 dBi
	PCS1900: -3.5 dBi
	UMTS-FDD Band V: -3.6 dBi
	UMTS-FDD Band IV: -3.5 dBi
	UMTS-FDD Band II: -3.5 dBi
	Bluetooth/BLE: -5.3 dBi
	WIFI: -5.3 dBi
	GPS:-3.8 dBi

Type of Modulation:	GSM / GPRS: GMSK
	EGPRS: GMSK, 8PSK
	UMTS-FDD: QPSK, 16QAM
	802.11b/g/n: DSSS, OFDM
	Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK
	BLE: GFSK
	GPS: BPSK

RF Operating Frequency (ies):

- GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz
- PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz
- UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz
- UMTS-FDD Band IV TX: 1712.4 ~ 1752.6 MHz;
RX : 2112.4 ~ 2152.6 MHz
- UMTS-FDD Band II TX: 1852.4 ~ 1907.6 MHz;
RX: 1932.4 ~ 1987.6 MHz
- WIFI: 802.11b/g/n(20M): 2412-2462 MHz

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WIFI:802.11n(40M): 2422-2452 MHz

Bluetooth& BLE: 2402-2480 MHz

GPS RX:1575.42 MHz

Max. Output Power:

802.11b: 9.24dBm

802.11g: 9.17dBm

802.11n(20M): 9.26dBm

802.11n(40M): 9.03dBm

Number of Channels:

GSM 850: 124CH

PCS1900: 299CH

UMTS-FDD Band V : 102CH

UMTS-FDD Band IV: 202CH

UMTS-FDD Band II : 277CH

WIFI :802.11b/g/n(20M): 11CH

WIFI :802.11n(40M): 7CH

Bluetooth: 79CH

BLE: 40CH

GPS:1CH

Port:

Power Port, Earphone Port, USB Port

Input Power:

Battery:

Model: 365778

Spec: 3.7V,2000mAh(7.4Wh)

Limited Charging Voltage: 4.2V

Adapter:

Model:ES-CD0501000C

Input: 100-240V; 50/60Hz; 0.3A

Output: DC 5.0V,1000mA

Trade Name :

VeryKool

GPRS/EGPRS Multi-slot class

8/10/12

FCC ID:

WA6S5001

5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.247 (a)(2)	DTS (6 dB&20 dB) CHANNEL BANDWIDTH	Compliance
§15.247(b)(3)	Conducted Maximum Output Power	Compliance
§15.247(e)	Power Spectral Density	Compliance
§15.247(d)	Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Spurious Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
-	-	-

6. Measurements, Examination And Derived Results

6.1 Antenna Requirement

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has 2 antennas:

A permanently attached PIFA antenna for Bluetooth/BLE/WIFI/GPS, the gain is -5.3dBi for Bluetooth/BLE, the gain is -5.3dBi for WIFI, the gain is -3.8dBi for GPS.

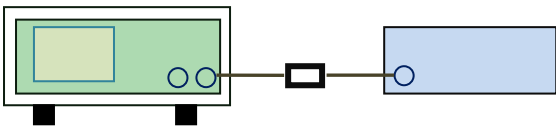
A permanently attached PIFA antenna for GSM/PCS and UMTS, the gain is -3.9dBi for GSM850, -3.5dBi for PCS1900, -3.6dBi for UMTS-FDD Band V, -3.5dBi for UMTS-FDD Band IV, -3.5dBi for UMTS-FDD Band II.

The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	23°C
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	September 22, 2015
Tested By :	Winnie Zhang

Spec	Item	Requirement	Applicable
§ 15.247(a)(2) RSS Gen(4.6.1)	a)	6dB BW ≥ 500kHz; 20dB BW ≥ 500kHz;	<input checked="" type="checkbox"/>
	b)	99% BW: For FCC reference only; required by IC.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>558074 D01 DTS MEAS Guidance v03r02, 8.1 DTS bandwidth</p> <p><u>6dB bandwidth</u></p> <ol style="list-style-type: none"> Set RBW = 100 kHz. Set the video bandwidth (VBW) ≥ 3 × RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. <p><u>20dB bandwidth</u></p> <p>C63.10 Occupied Bandwidth (OBW=20dB bandwidth)</p> <ol style="list-style-type: none"> Set RBW = 1%-5% OBW. Set the video bandwidth (VBW) ≥ 3 x RBW. Set the span range between 2 times and 5 times of the OBW. Sweep time=Auto, Detector=PK, Trace=Max hold. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce the worst- 		

	case (i.e., the widest) bandwidth. Unless otherwise specified for an unlicensed wireless device, measure the bandwidth at the 20 dB levels with respect to the reference level.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

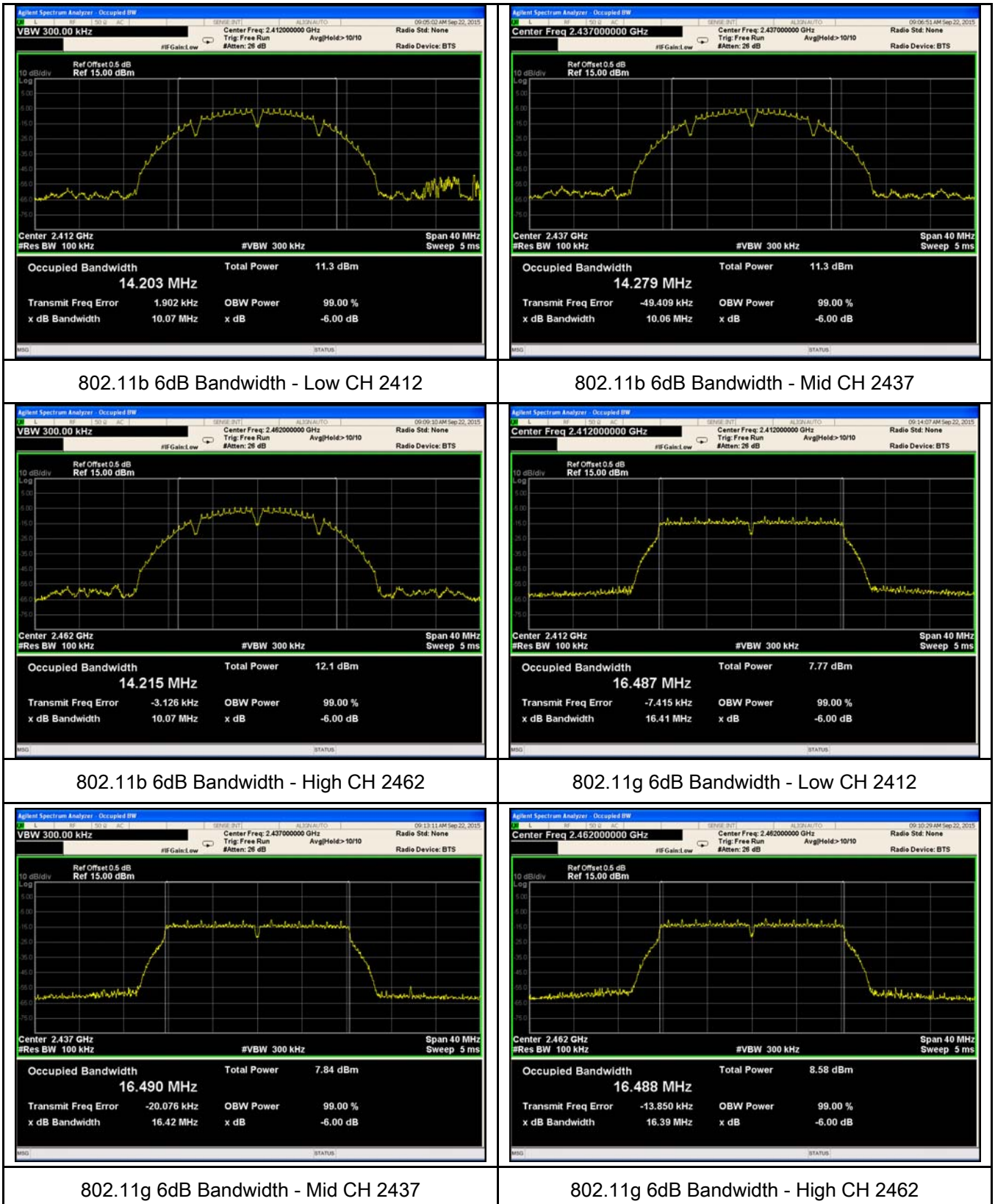
Test Plot ☒ Yes (See below) ☐ N/A

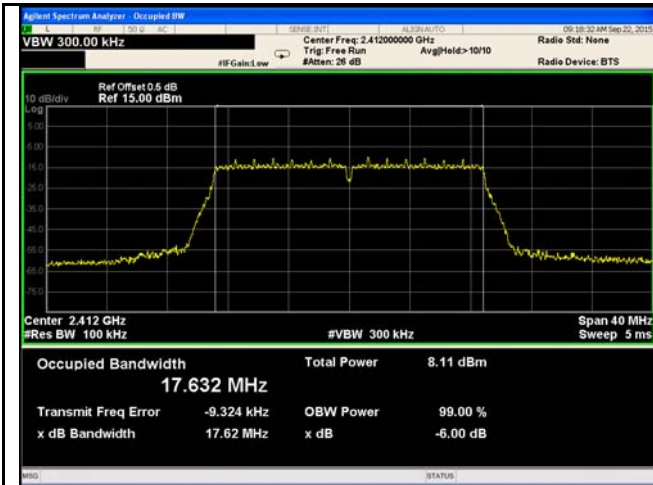
Measurement result

Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.070	14.210	≥ 0.5
	Mid	2437	10.060	14.271	≥ 0.5
	High	2462	10.070	14.236	≥ 0.5
802.11g	Low	2412	16.487	16.897	≥ 0.5
	Mid	2437	16.490	16.937	≥ 0.5
	High	2462	16.488	16.909	≥ 0.5
802.11n (20M)	Low	2412	17.632	17.836	≥ 0.5
	Mid	2437	17.649	17.869	≥ 0.5
	High	2462	17.630	17.845	≥ 0.5
802.11n (40M)	Low	2422	36.100	36.112	≥ 0.5
	Mid	2437	36.142	36.161	≥ 0.5
	High	2452	36.129	36.165	≥ 0.5

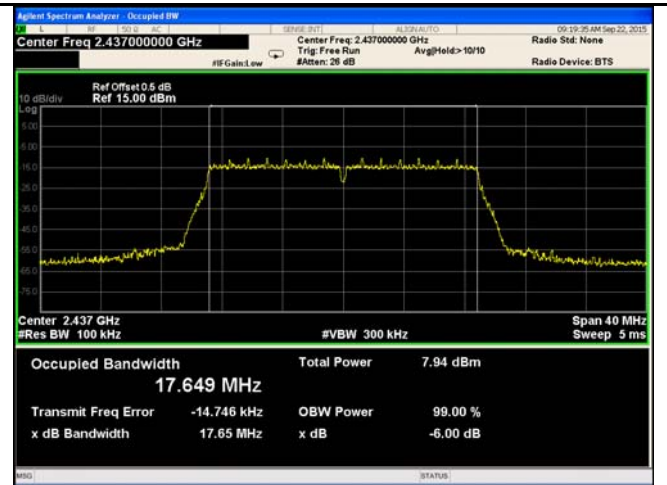
Test Plots

6dB Bandwidth measurement result

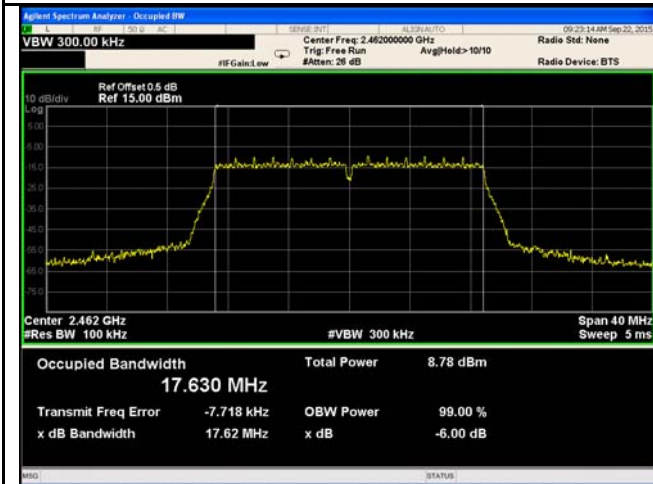




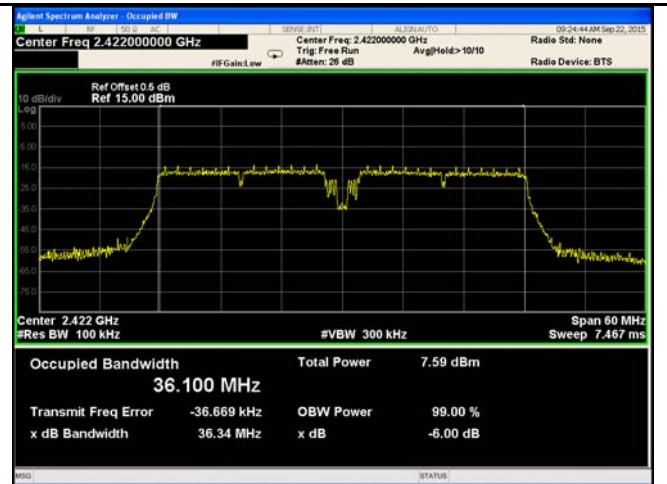
802.11n20 6dB Bandwidth - Low CH 2412



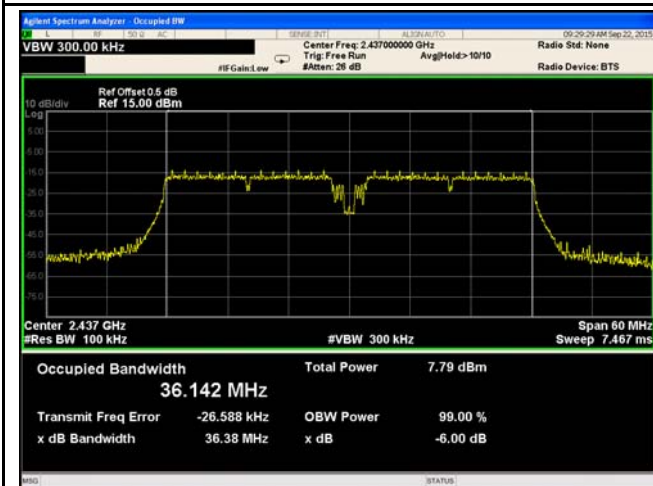
802.11n20 6dB Bandwidth - Mid CH 2437



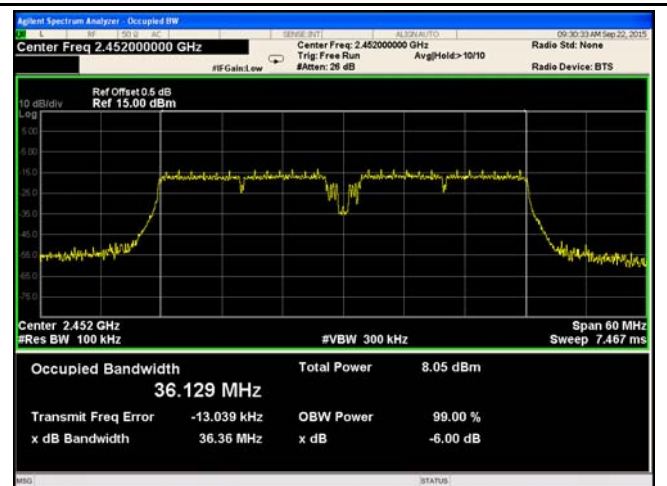
802.11n20 6dB Bandwidth - High CH 2462



802.11n40 6dB Bandwidth - Low CH 2422

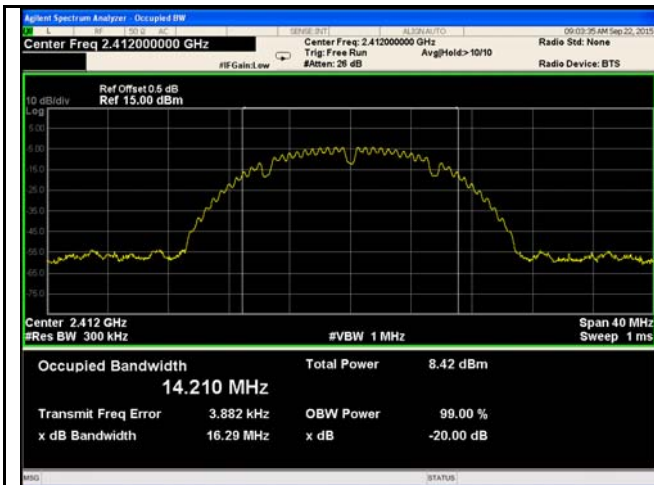


802.11n40 6dB Bandwidth - Mid CH 2437

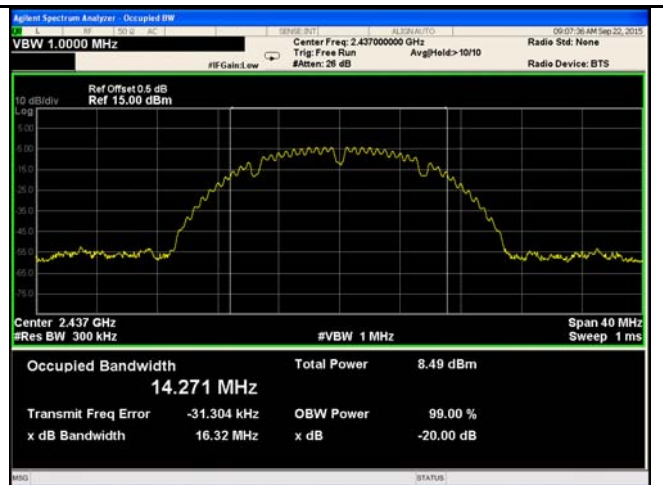


802.11n40 6dB Bandwidth - High CH 2452

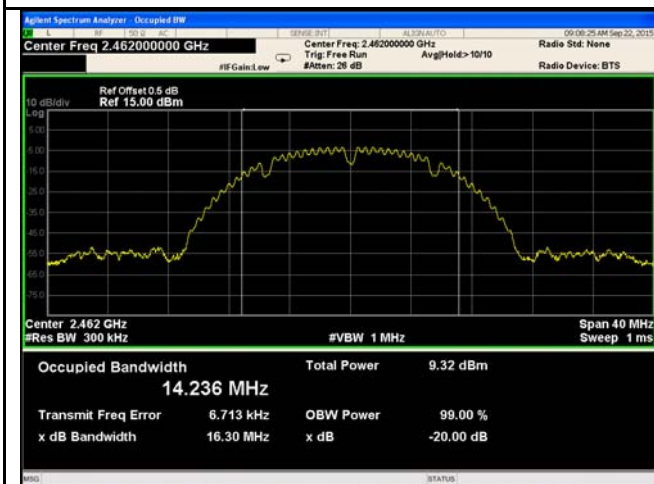
20 dB Bandwidth measurement result



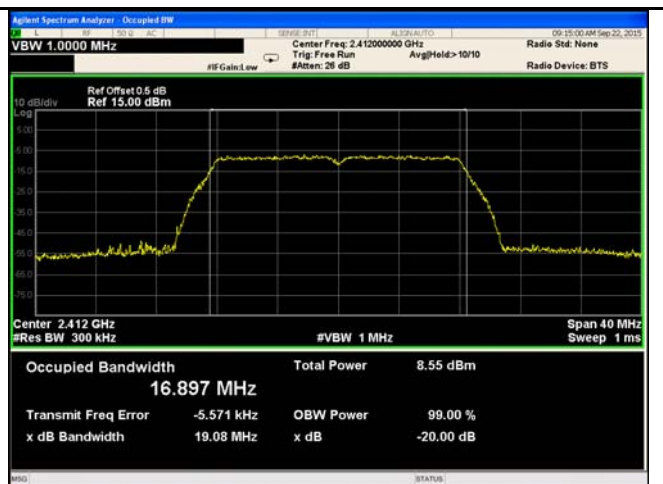
802.11b 20dB Bandwidth - Low CH 2412



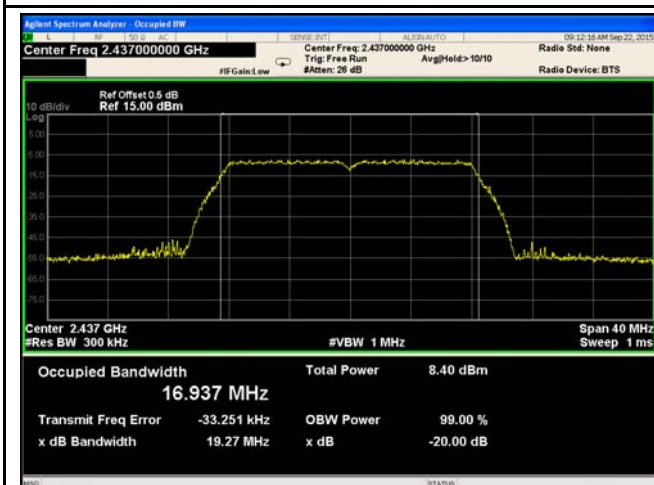
802.11b 20dB Bandwidth - Mid CH 2437



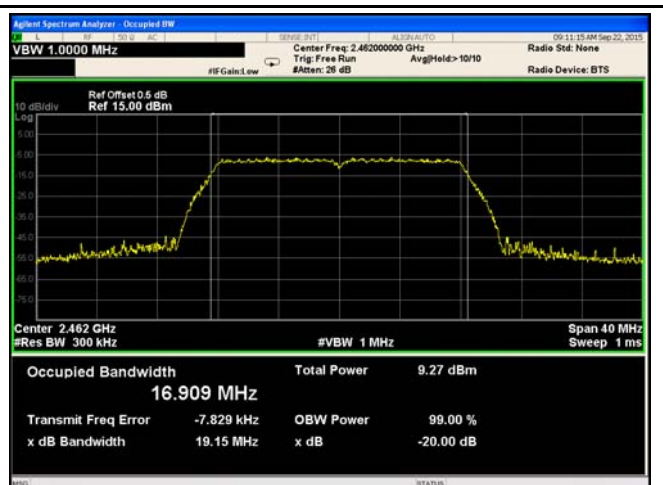
802.11b 20dB Bandwidth - High CH 2462



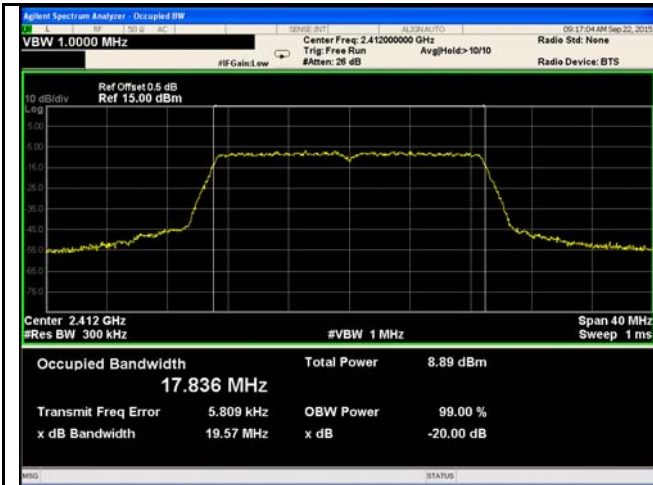
802.11g 20dB Bandwidth - Low CH 2412



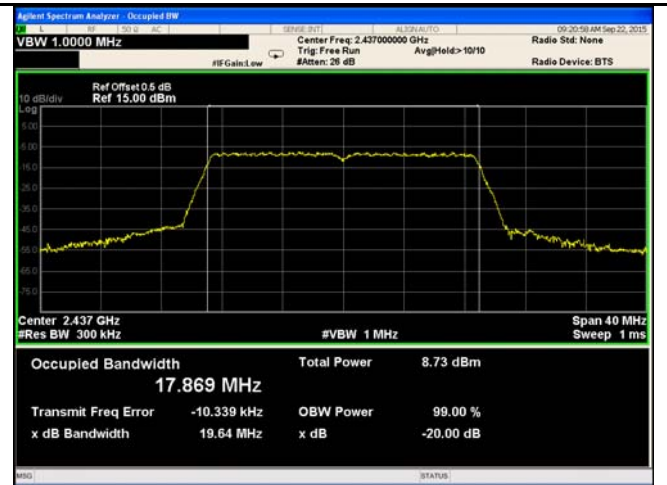
802.11g 20dB Bandwidth - Mid CH 2437



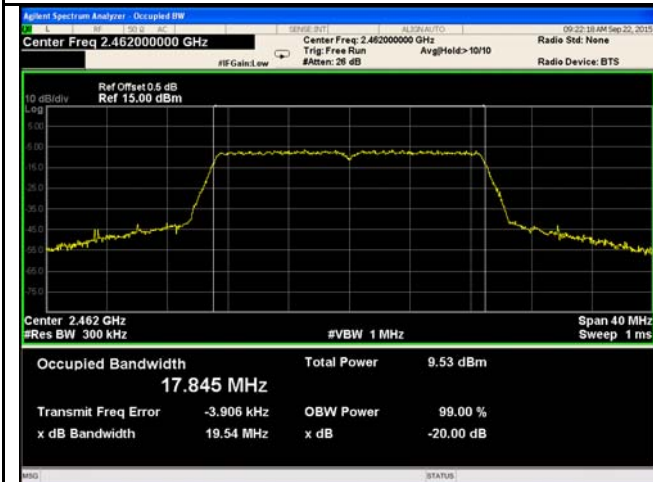
802.11g 20dB Bandwidth - High CH 2462



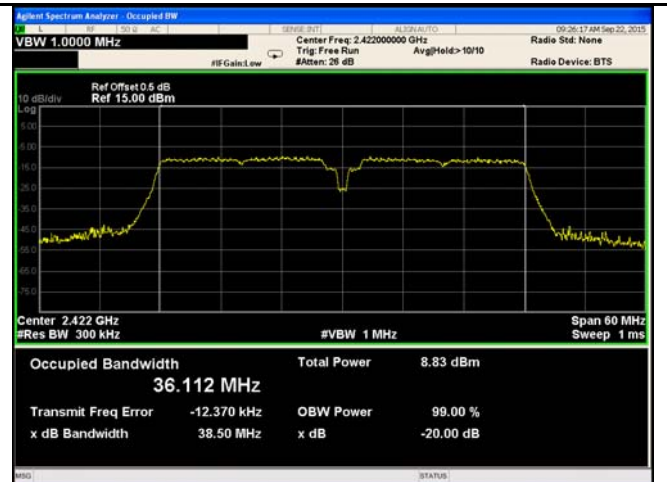
802.11n20 20dB Bandwidth - Low CH 2412



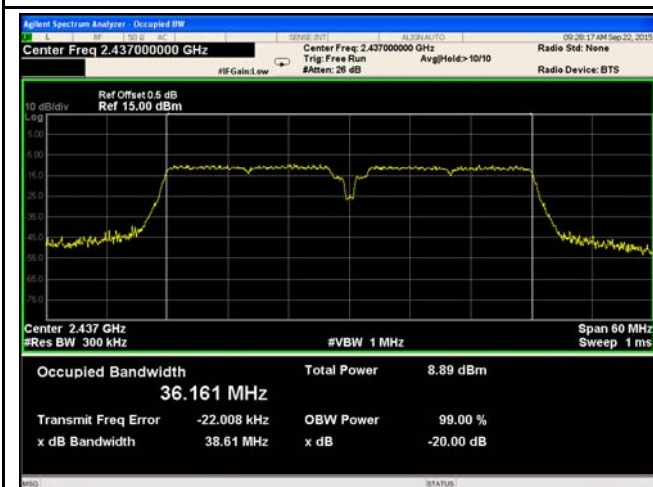
802.11n20 20dB Bandwidth - Mid CH 2437



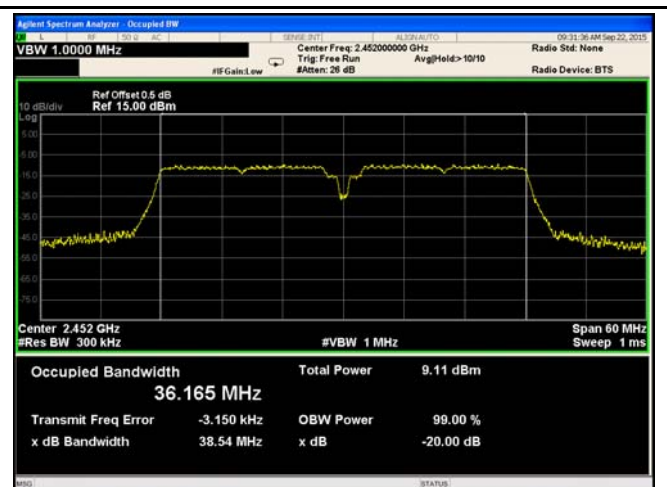
802.11n20 20dB Bandwidth - High CH 2462



802.11n40 20dB Bandwidth - Low CH 2422



802.11n40 20dB Bandwidth - Mid CH 2437

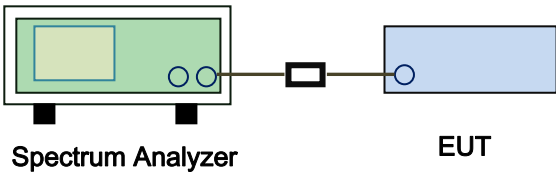


802.11n40 20dB Bandwidth - High CH 2452

6.3 Maximum Output Power

Temperature	23°C
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	September 22, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (2),RSS210 (A8.4)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	<input type="checkbox"/>
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	<input type="checkbox"/>
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with ≥ 25 & <50 channels: ≤ 0.25 Watt	<input type="checkbox"/>
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>558074 D01 DTS MEAS Guidance v03r02, 9.1.2 Integrated band power method</p> <p>Maximum output power measurement procedure</p> <ul style="list-style-type: none"> - a) Set span to at least 1.5 times the OBW. - b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz. - c) Set VBW $\geq 3 \times$ RBW. - d) Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.) - e) Sweep time = auto. - f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. - g) If transmit duty cycle $< 98\%$, use a sweep trigger with the level set to enable 		

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	<p>triggering only on full power pulses. The transmitter shall operate at maximum power control level for the entire duration of every sweep. If the EUT transmits continuously (i.e., with no off intervals) or at duty cycle $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to "free run".</p> <ul style="list-style-type: none"> - h) Trace average at least 100 traces in power averaging (i.e., RMS) mode. - i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Output Power measurement result

Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	8.56	30	Pass
		Mid	2437	8.39	30	Pass
		High	2462	9.24	30	Pass
	802.11g	Low	2412	8.67	30	Pass
		Mid	2437	8.53	30	Pass
		High	2462	9.17	30	Pass
	802.11n (20M)	Low	2412	8.64	30	Pass
		Mid	2437	8.59	30	Pass
		High	2462	9.26	30	Pass
	802.11n (40M)	Low	2422	8.55	30	Pass
		Mid	2437	8.78	30	Pass
		High	2452	9.03	30	Pass

Test Plots

The Average Power



802.11b - AV Output power - Low CH 2412



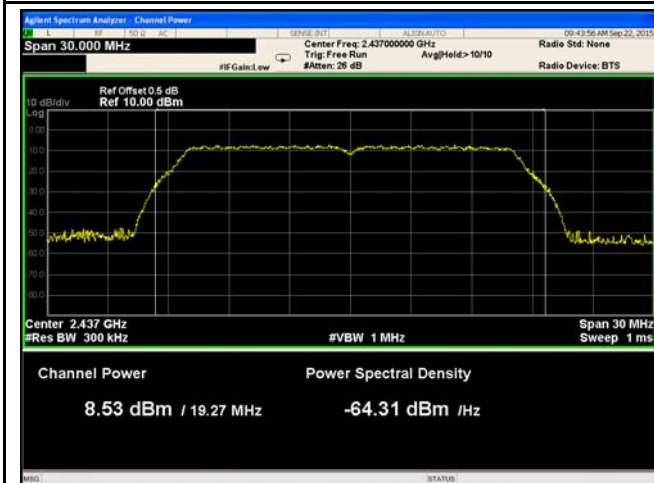
802.11b - AV Output power - Mid CH 2437



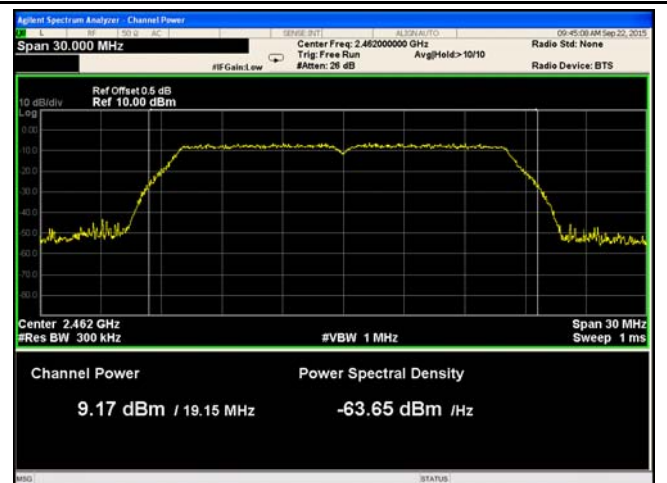
802.11b - AV Output power - High CH 2462



802.11g - AV Output power - Low CH 2412



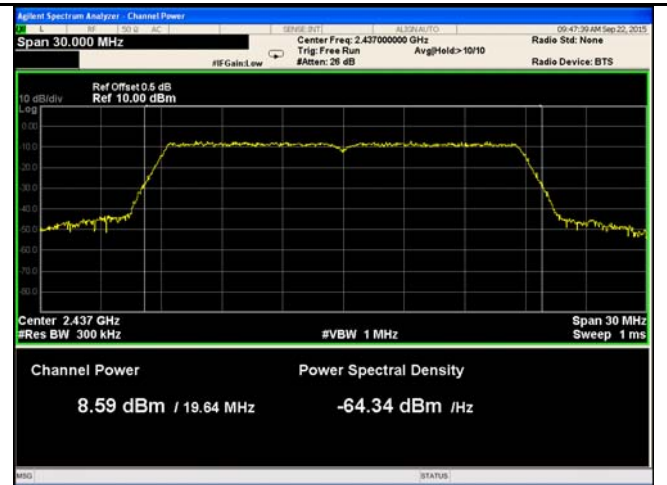
802.11g - AV Output power - Mid CH 2437



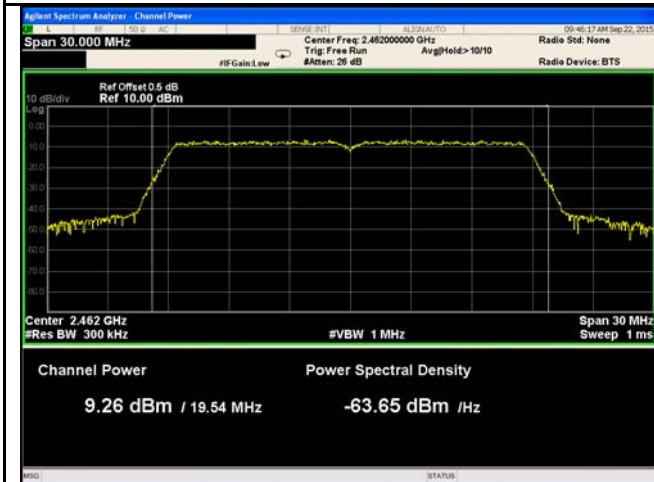
802.11g - AV Output power - High CH 2462



802.11n20 - AV Output power - Low CH 2412



802.11n20 - AV Output power - Mid CH 2437



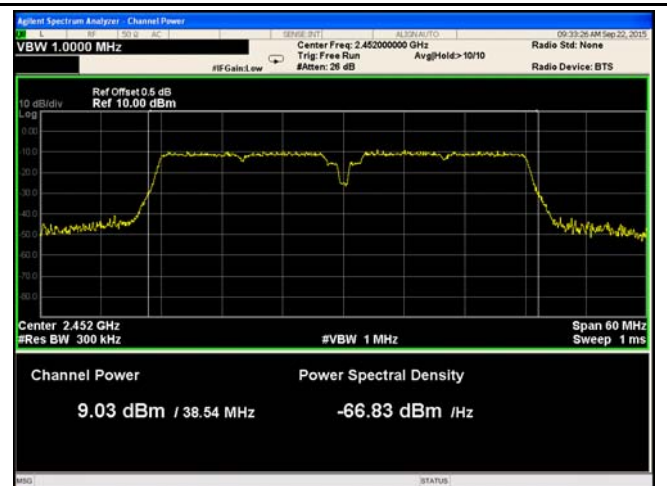
802.11n20 - AV Output power - High CH 2462



802.11n40 - AV Output power - Low CH 2422



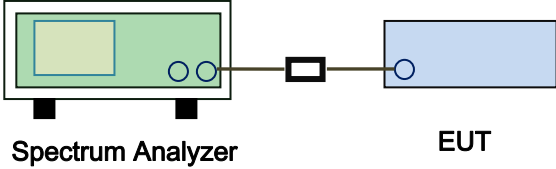
802.11n40 - AV Output power - Mid CH 2437



802.11n40 - AV Output power - High CH 2452

6.4 Power Spectral Density

Temperature	23°C
Relative Humidity	55%
Atmospheric Pressure	1022mbar
Test date :	September 22, 2015
Tested By :	Winnie Zhang

Spec	Item	Requirement	Applicable
§15.247(e)	a)	The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>558074 D01 DTS MEAS Guidance v03r02, 10.2 power spectral density method power spectral density measurement procedure</p> <ul style="list-style-type: none"> - a) Set analyzer center frequency to DTS channel center frequency. - b) Set the span to 1.5 times the DTS bandwidth. - c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. - d) Set the VBW $\geq 3 \times \text{RBW}$. - e) Detector = peak. - f) Sweep time = auto couple. - g) Trace mode = max hold. - h) Allow trace to fully stabilize. - i) Use the peak marker function to determine the maximum amplitude level within the RBW. - j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat. 		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

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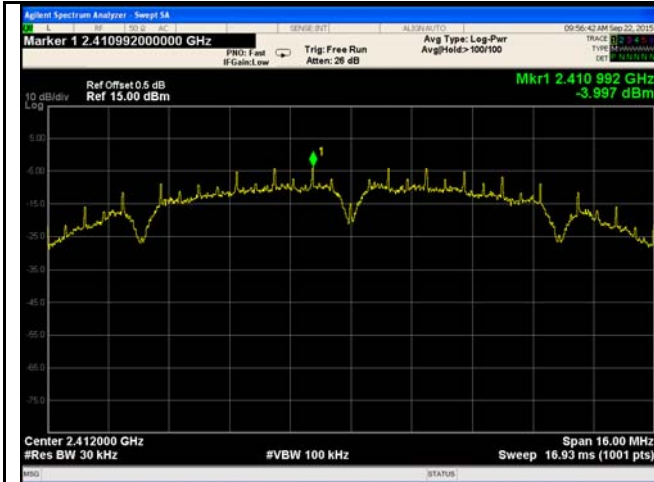
Test Data ☒ Yes ☐ N/A
Test Plot ☒ Yes (See below) ☐ N/A

Power Spectral Density measurement result

Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	802.11b	Low	2412	-3.997	8	Pass
		Mid	2437	-4.363	8	Pass
		High	2462	-3.258	8	Pass
	802.11g	Low	2412	-13.454	8	Pass
		Mid	2437	-13.960	8	Pass
		High	2462	-12.719	8	Pass
	802.11n (20M)	Low	2412	-13.208	8	Pass
		Mid	2437	-13.291	8	Pass
		High	2462	-12.581	8	Pass
	802.11n (40M)	Low	2422	-11.947	8	Pass
		Mid	2437	-12.038	8	Pass
		High	2452	-11.727	8	Pass

Test Plots

Power Spectral Density measurement result



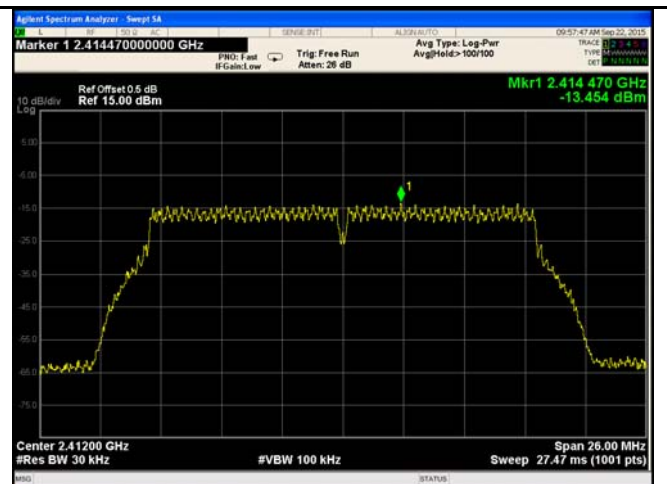
PSD - Low CH 2412 - 802.11b



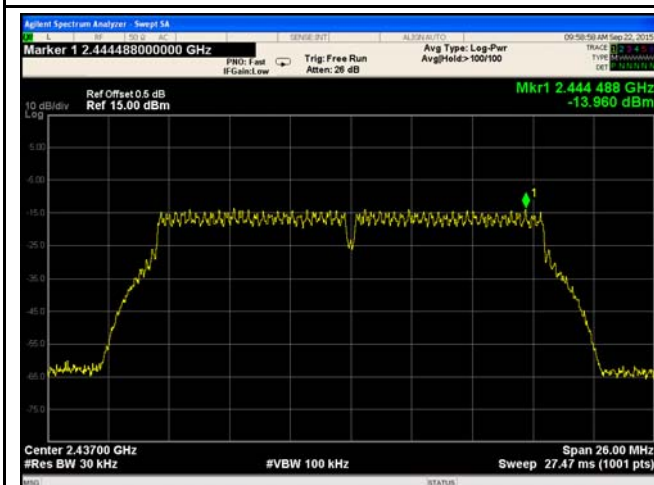
PSD - Mid CH 2437 - 802.11b



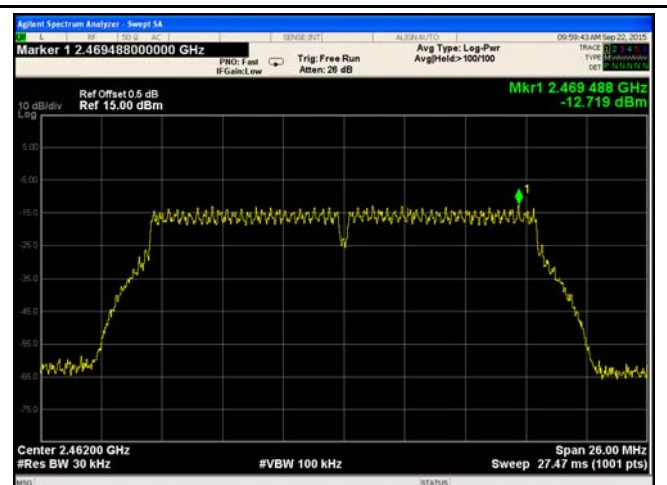
PSD - High CH 2462 - 802.11b



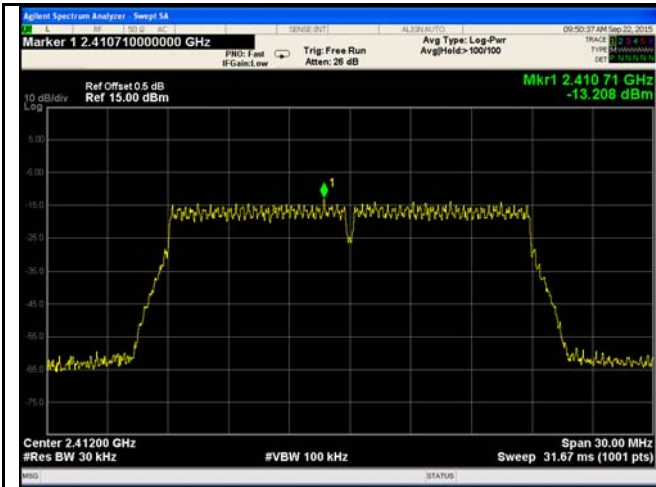
PSD - Low CH 2412 -802.11g



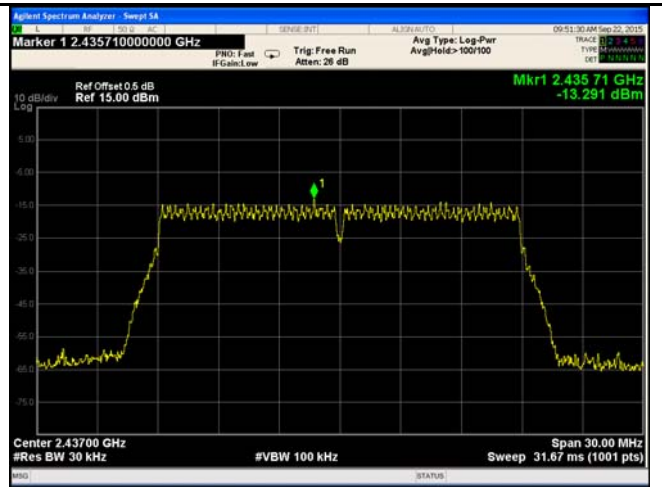
PSD - Mid CH 2437 - 802.11g



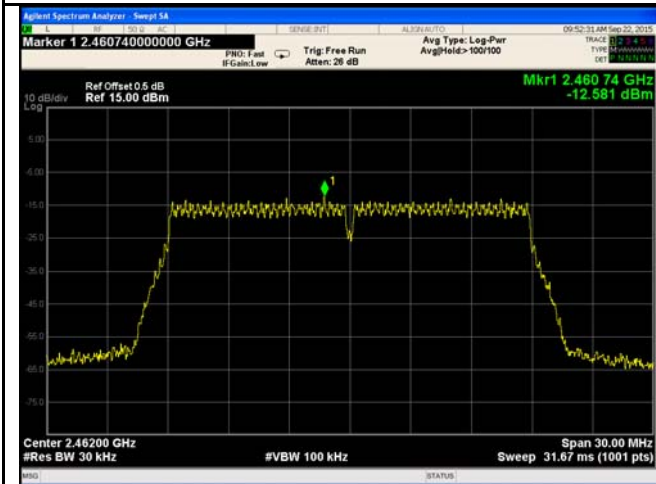
PSD - High CH 2462 - 802.11g



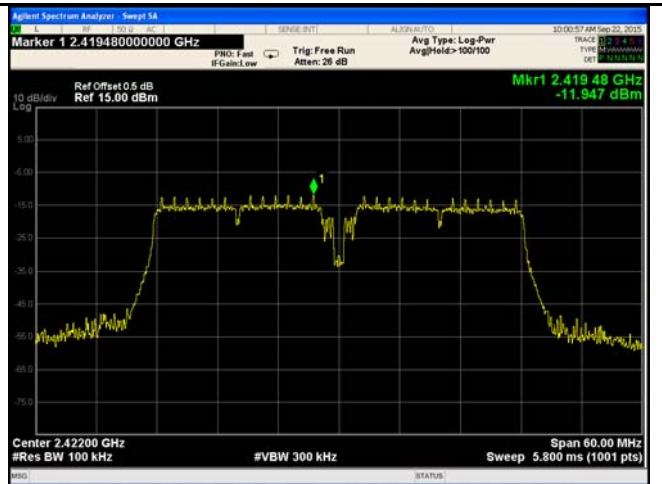
PSD - Low CH 2412 - 802.11n20



PSD - Mid CH 2437 - 802.11n20



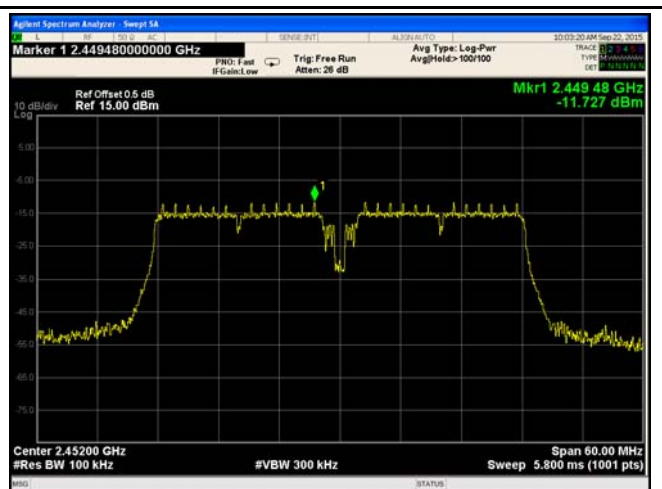
PSD - High CH 2462 - 802.11n20



PSD - Low CH 2422 - 802.11n40



PSD - Mid CH 2437 - 802.11n40



PSD - High CH 2462 - 802.11n40

6.5 Band-Edge & Unwanted Emissions into Non-Restricted Frequency Bands

Temperature	23°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(d)	a)	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.	<input checked="" type="checkbox"/>

Test Setup	
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Test Procedure	<p>Radiated Method Only</p> <ul style="list-style-type: none"> 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge,
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	<p>check the emission of EUT, if pass then set Spectrum Analyzer as below:</p> <p>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz.</p> <p>c. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz.</p> <ul style="list-style-type: none"> - 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

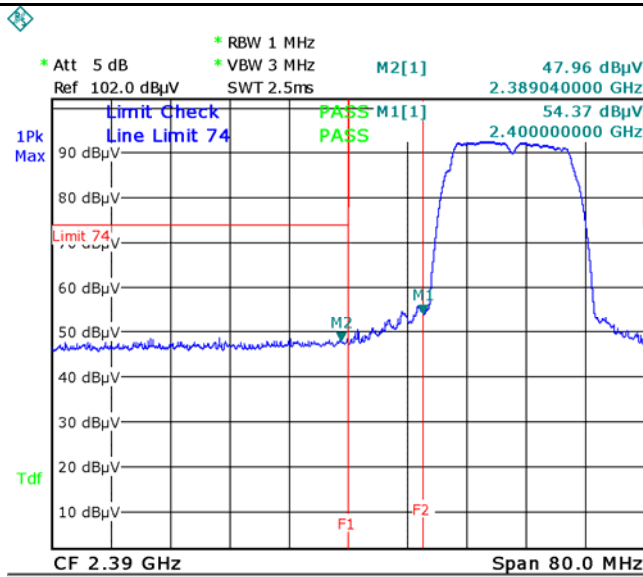
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Plots

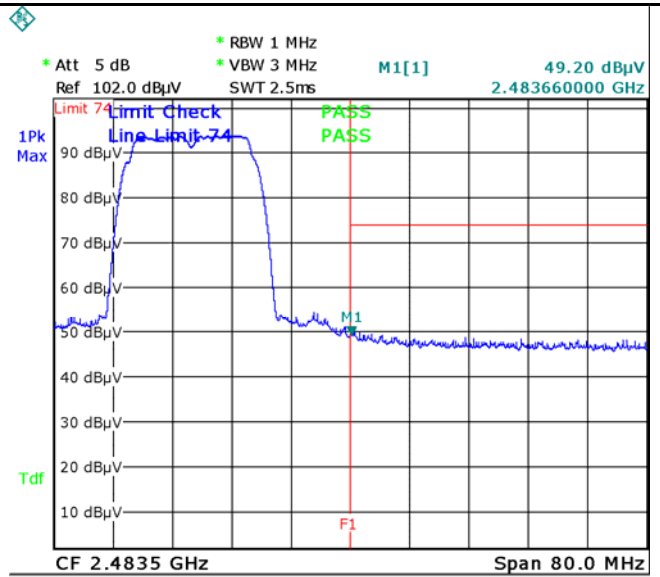
Band Edge measurement result

<p> * Att 5 dB * RBW 1 MHz * VBW 3 MHz Ref 102.0 dBμV SWT 2.5ms M2[1] 46.51 dBμV 2.385050000 GHz 46.79 dBμV 2.400000000 GHz Limit Check Line Limit 74 PASS M1[1] PASS CF 2.39 GHz Span 80.0 MHz Date: 21.SEP.2015 14:36:04 </p>	<p> * Att 5 dB * RBW 1 MHz * VBW 3 MHz Ref 102.0 dBμV SWT 2.5ms M1[1] 45.47 dBμV 2.483660000 GHz Limit Check Line Limit 74 PASS M1[1] PASS CF 2.4835 GHz Span 80.0 MHz Date: 21.SEP.2015 15:35:53 </p>
<p>Band Edge, Left Side (Peak) - 802.11b</p> <p>Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz</p>	<p>Band Edge, Right Side (Peak) - 802.11b</p> <p>Note: F1 is frequency 2483.5MHz</p>
<p>Note: (no need if PK value less than the AV limit)</p>	<p>Note: (no need if PK value less than the AV limit)</p>
<p>Band Edge, Left Side (Average) - 802.11b</p>	<p>Band Edge, Right Side (Average) - 802.11b</p>



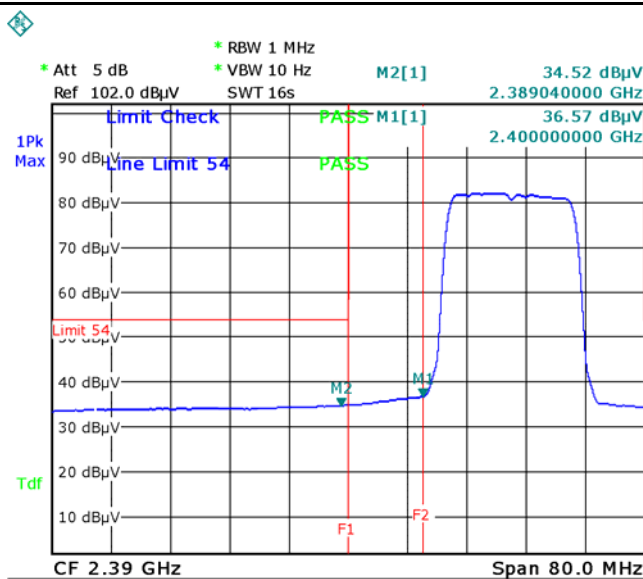
Band Edge, Left Side (Peak) - 802.11g

Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz



Band Edge, Right Side (Peak) - 802.11g

Note: F1 is frequency 2483.5MHz



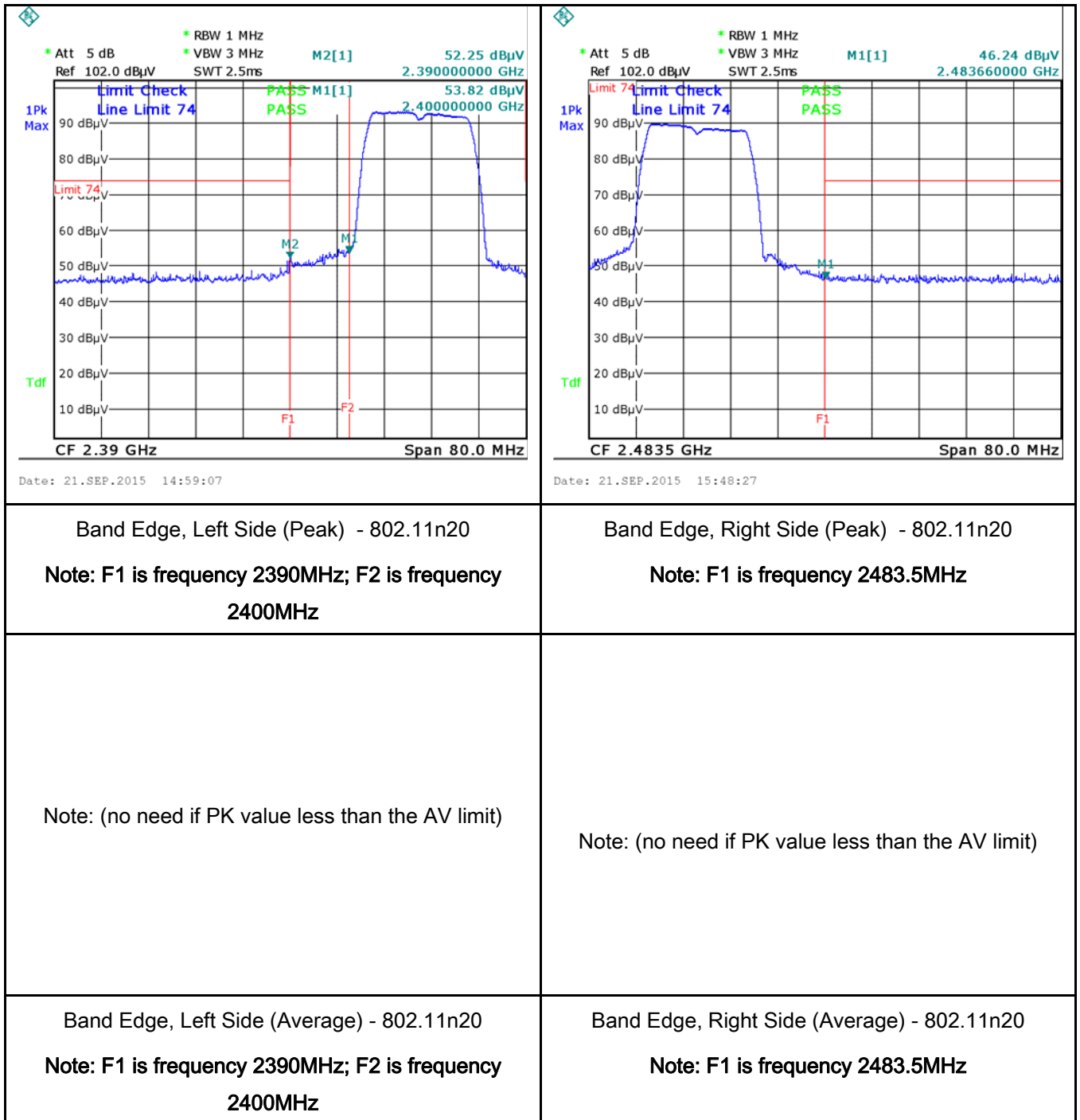
Band Edge, Left Side (Average) - 802.11g

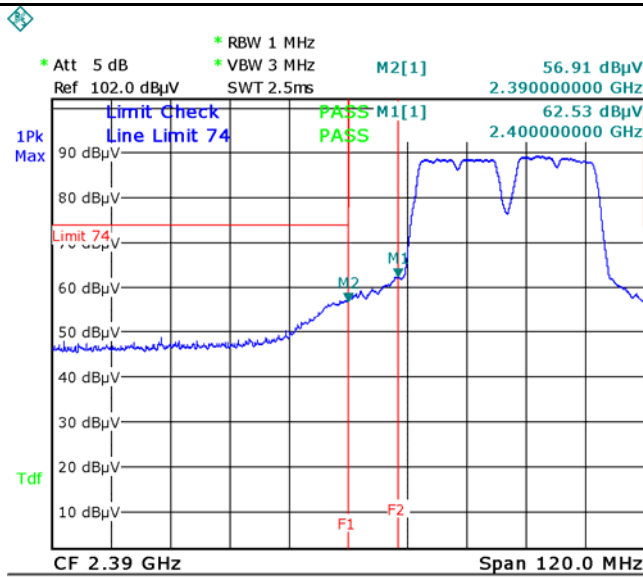
Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz

Note: (no need if PK value less than the AV limit)

Band Edge, Right Side (Average) - 802.11g

Note: F1 is frequency 2483.5MHz

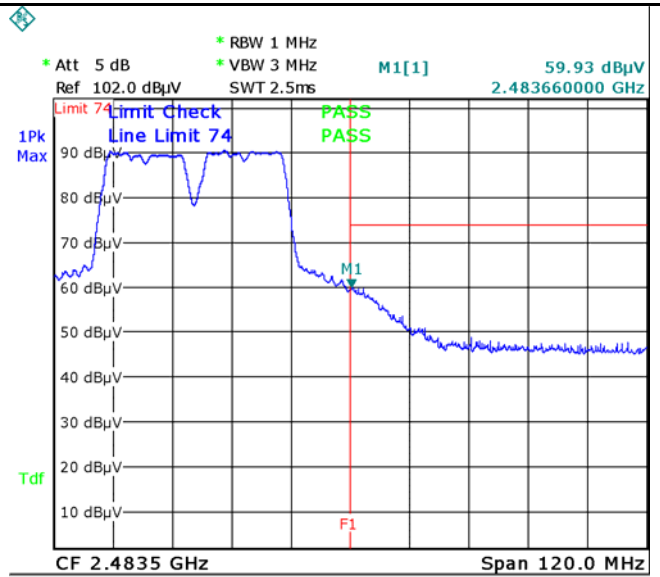




Date: 21.SEP.2015 15:29:05

Band Edge, Left Side (Peak) - 802.11n40

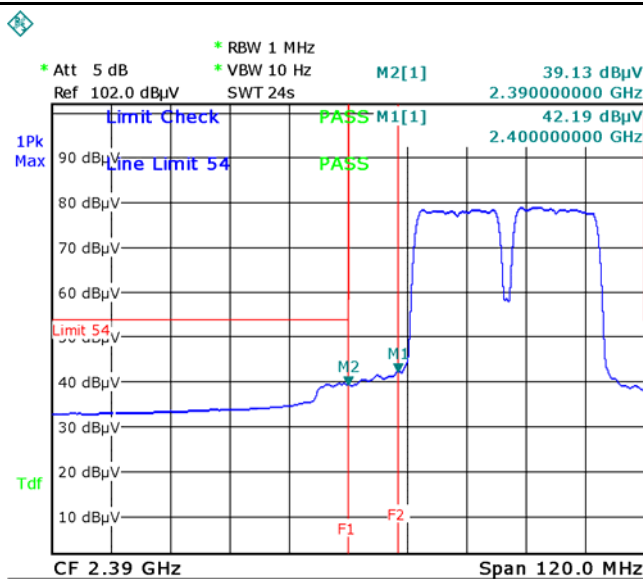
Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz



Date: 21.SEP.2015 15:54:00

Band Edge, Right Side (Peak) - 802.11n40

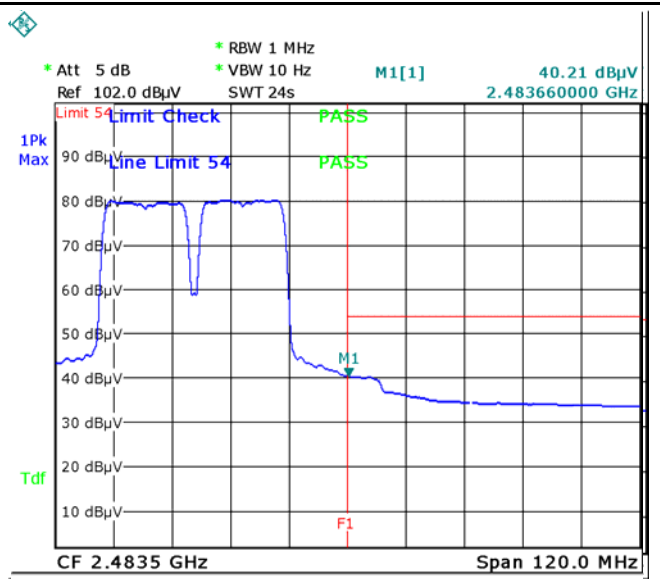
Note: F1 is frequency 2483.5MHz



Date: 21.SEP.2015 15:30:05

Band Edge, Left Side (Average) - 802.11n40

Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz



Date: 21.SEP.2015 15:56:47

Band Edge, Right Side (Average) - 802.11n40

Note: F1 is frequency 2483.5MHz

6.6 AC Power Line Conducted Emissions

Temperature	23°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable														
47CFR§15.207, RSS210 (A8.1)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	<div><input checked="" type="checkbox"/></div>														
		<table><tr><th rowspan="2">Frequency ranges (MHz)</th><th colspan="2">Limit (dBµV)</th></tr><tr><th>QP</th><th>Average</th></tr><tr><td>0.15 ~ 0.5</td><td>66 – 56</td><td>56 – 46</td></tr><tr><td>0.5 ~ 5</td><td>56</td><td>46</td></tr><tr><td>5 ~ 30</td><td>60</td><td>50</td></tr></table>		Frequency ranges (MHz)	Limit (dBµV)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50
		Frequency ranges (MHz)			Limit (dBµV)												
				QP	Average												
		0.15 ~ 0.5		66 – 56	56 – 46												
0.5 ~ 5	56	46															
5 ~ 30	60	50															
Test Setup		<div><p>Note: 1.Support units were connected to second LISN. 2.Both of LISNs (AMN) are 80cm from EUT and at least 80cm from other units and other metal planes support units.</p></div>															
Procedure		<div><div>1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.</div><div>2. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</div><div>3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</div><div>4. All other supporting equipment were powered separately from another main supply.</div></div>															

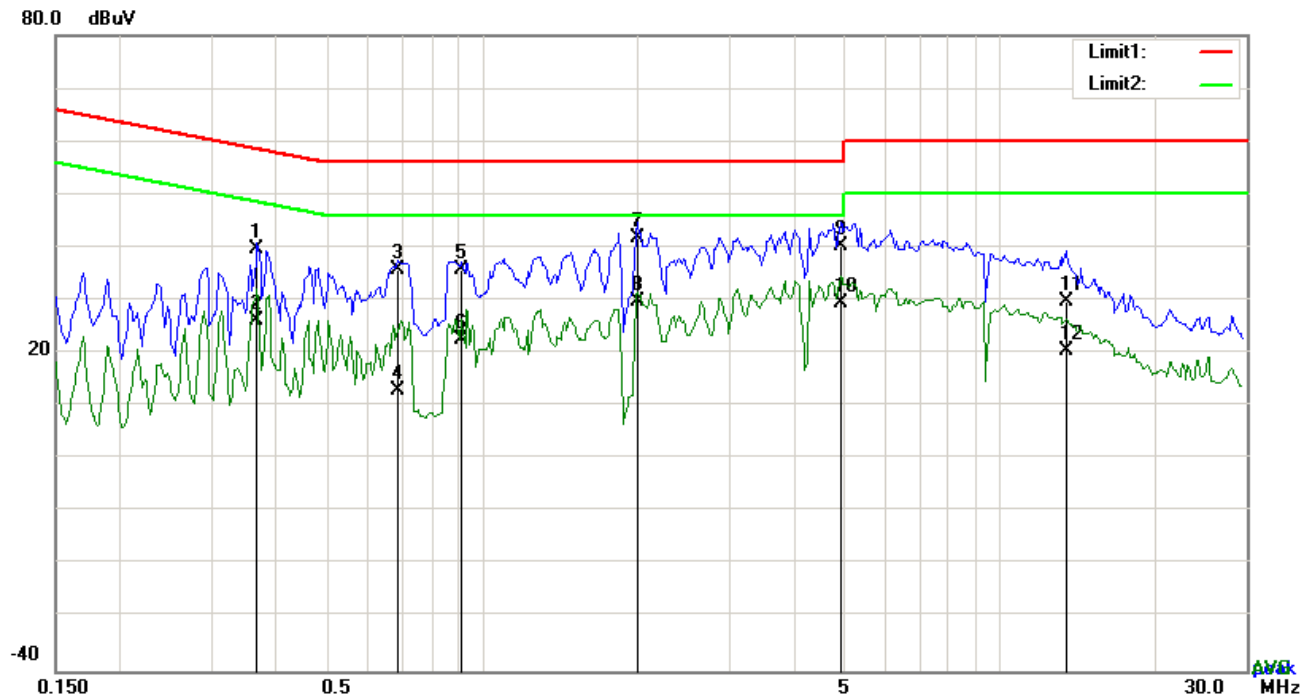
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	<p>5. The EUT was switched on and allowed to warm up to its normal operating condition.</p> <p>6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.</p> <p>7. High peaks, relative to the limit line, The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz.</p> <p>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).</p>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Mode: Transmitting Mode

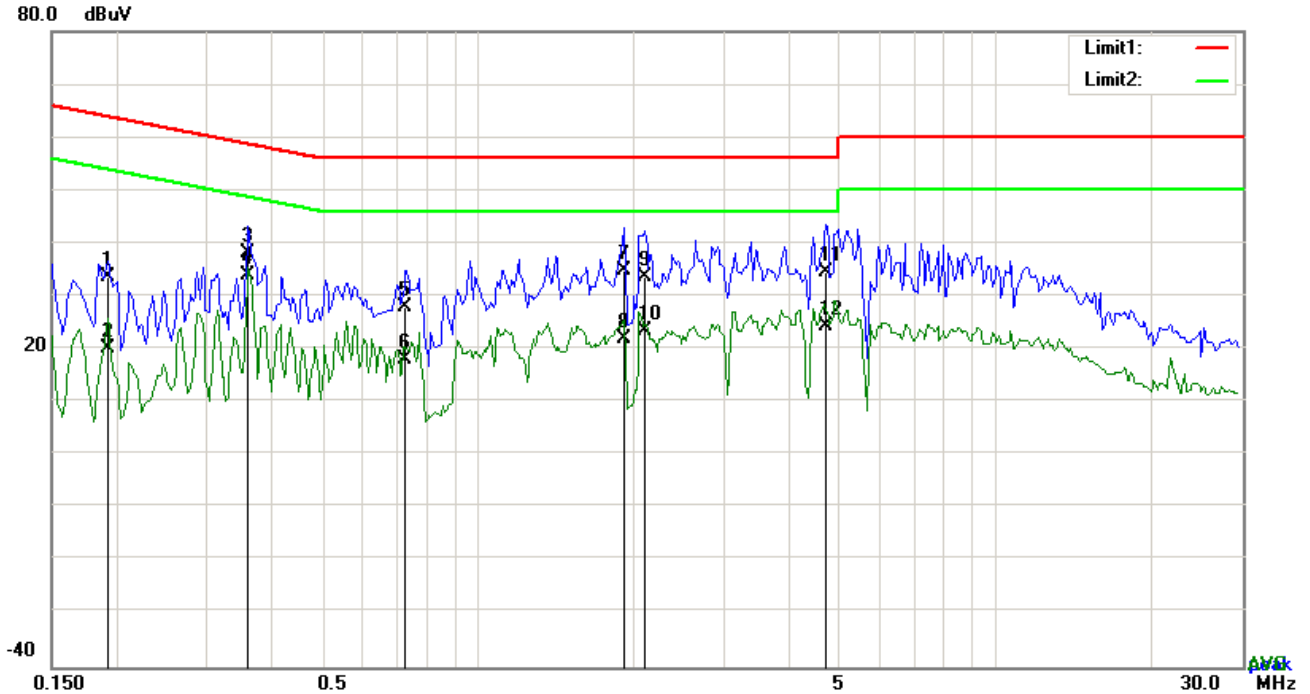


Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	L1	0.3684	29.54	QP	10.03	39.57	58.54	-18.97
2	L1	0.3684	16.08	AVG	10.03	26.11	48.54	-22.43
3	L1	0.6882	25.64	QP	10.03	35.67	56.00	-20.33
4	L1	0.6882	2.99	AVG	10.03	13.02	46.00	-32.98
5	L1	0.9105	25.81	QP	10.03	35.84	56.00	-20.16
6	L1	0.9105	12.50	AVG	10.03	22.53	46.00	-23.47
7	L1	1.9986	31.65	QP	10.04	41.69	56.00	-14.31
8	L1	1.9986	19.62	AVG	10.04	29.66	46.00	-16.34
9	L1	4.9461	30.26	QP	10.08	40.34	56.00	-15.66
10	L1	4.9461	19.41	AVG	10.08	29.49	46.00	-16.51
11	L1	13.4364	19.66	QP	10.20	29.86	60.00	-30.14
12	L1	13.4364	10.14	AVG	10.20	20.34	50.00	-29.66

Test Mode: Transmitting Mode

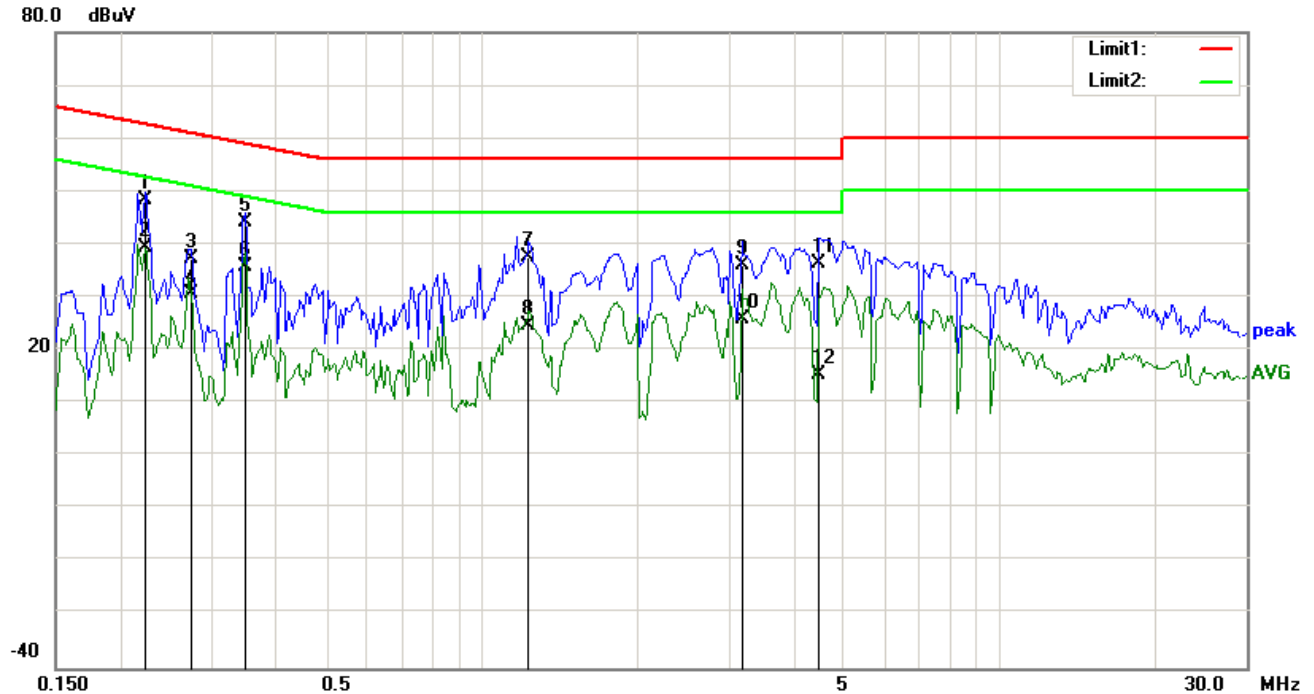


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	N	0.1929	23.52	QP	10.02	33.54	63.91	-30.37
2	N	0.1929	10.09	AVG	10.02	20.11	53.91	-33.80
3	N	0.3606	28.12	QP	10.02	38.14	58.71	-20.57
4	N	0.3606	24.03	AVG	10.02	34.05	48.71	-14.66
5	N	0.7272	18.03	QP	10.02	28.05	56.00	-27.95
6	N	0.7272	7.89	AVG	10.02	17.91	46.00	-28.09
7	N	1.9167	24.71	QP	10.04	34.75	56.00	-21.25
8	N	1.9167	12.00	AVG	10.04	22.04	46.00	-23.96
9	N	2.1039	23.74	QP	10.04	33.78	56.00	-22.22
10	N	2.1039	13.50	AVG	10.04	23.54	46.00	-22.46
11	N	4.7199	24.54	QP	10.07	34.61	56.00	-21.39
12	N	4.7199	14.25	AVG	10.07	24.32	46.00	-21.68

Test Mode: Transmitting Mode

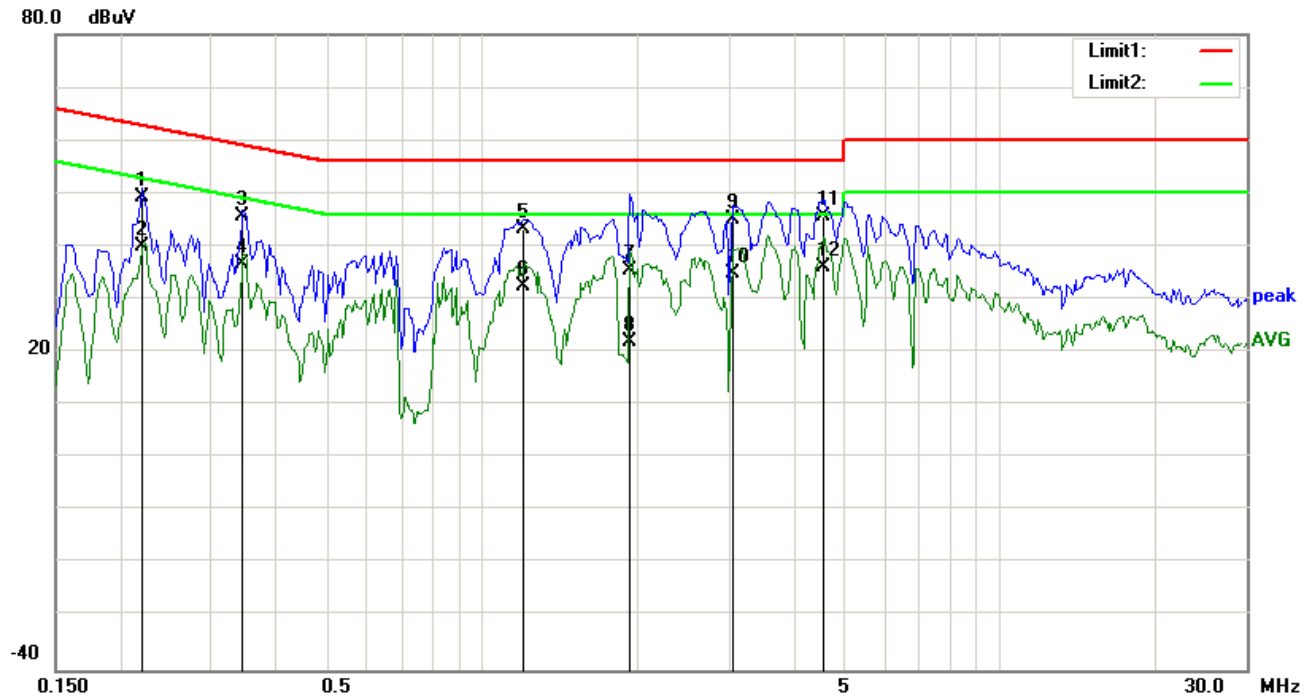


Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	L1	0.2241	38.19	QP	10.03	48.22	62.67	-14.45
2	L1	0.2241	29.20	AVG	10.03	39.23	52.67	-13.44
3	L1	0.2748	27.12	QP	10.03	37.15	60.97	-23.82
4	L1	0.2748	20.57	AVG	10.03	30.60	50.97	-20.37
5	L1	0.3489	34.13	QP	10.03	44.16	58.99	-14.83
6	L1	0.3489	25.70	AVG	10.03	35.73	48.99	-13.26
7	L1	1.2342	27.65	QP	10.03	37.68	56.00	-18.32
8	L1	1.2342	14.58	AVG	10.03	24.61	46.00	-21.39
9	L1	3.1755	25.97	QP	10.06	36.03	56.00	-19.97
10	L1	3.1755	15.94	AVG	10.06	26.00	46.00	-20.00
11	L1	4.4742	26.21	QP	10.07	36.28	56.00	-19.72
12	L1	4.4742	5.19	AVG	10.07	15.26	46.00	-30.74

Test Mode: Transmitting Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

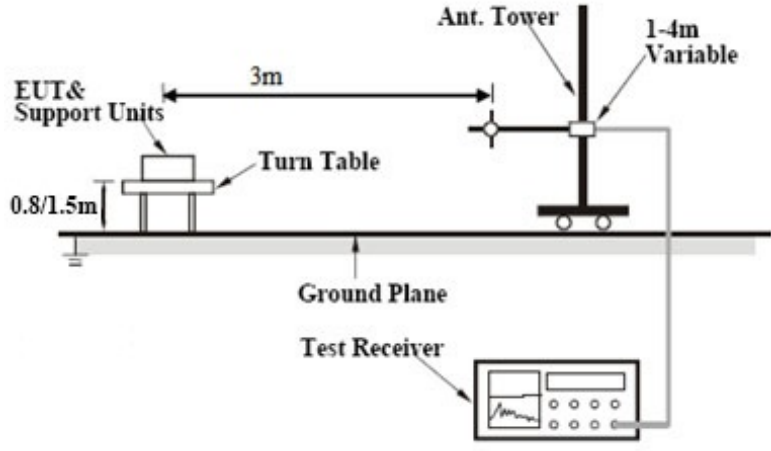
No.	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)
1	N	0.2202	39.28	QP	10.02	49.30	62.81	-13.51
2	N	0.2202	30.07	AVG	10.02	40.09	52.81	-12.72
3	N	0.3450	35.56	QP	10.02	45.58	59.08	-13.50
4	N	0.3450	26.52	AVG	10.02	36.54	49.08	-12.54
5	N	1.1991	33.17	QP	10.03	43.20	56.00	-12.80
6	N	1.1991	22.34	AVG	10.03	32.37	46.00	-13.63
7	N	1.9362	25.41	QP	10.04	35.45	56.00	-20.55
8	N	1.9362	12.05	AVG	10.04	22.09	46.00	-23.91
9	N	3.0429	35.14	QP	10.05	45.19	56.00	-10.81
10	N	3.0429	24.66	AVG	10.05	34.71	46.00	-11.29
11	N	4.5873	35.73	QP	10.07	45.80	56.00	-10.20
12	N	4.5873	25.87	AVG	10.07	35.94	46.00	-10.06

6.7 Radiated Spurious Emissions

Temperature	22°C
Relative Humidity	54%
Atmospheric Pressure	1021mbar
Test date :	September 21, 2015
Tested By :	Winnie Zhang

Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15.247(d), RSS210 (A8.5)	a)	<div>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</div> <table><tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table>	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	<div><input checked="" type="checkbox"/></div>
	Frequency range (MHz)	Field Strength (µV/m)											
	30 – 88	100											
	88 – 216	150											
216 960	200												
Above 960	500												
b)	<div>For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required</div> <div><input checked="" type="checkbox"/> 20 dB down <input type="checkbox"/> 30 dB down</div>	<div><input checked="" type="checkbox"/></div>											
c)	<div>or restricted band, emission must also comply with the radiated emission limits specified in 15.209</div>	<div><input checked="" type="checkbox"/></div>											

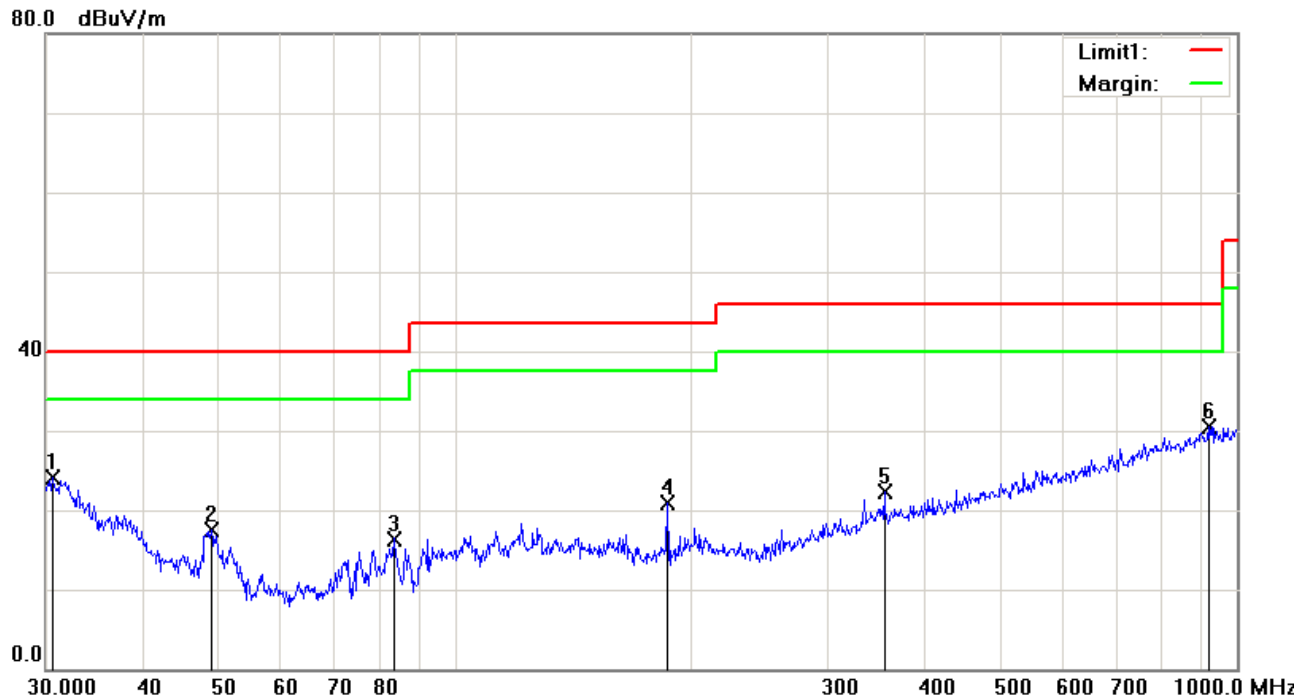
Test Setup	
Procedure	<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. The test was carried out at the selected frequency points obtained from the EUT characterization. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi Peak detection at frequency below 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz with Peak detection for Peak measurement at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz with Peak detection for Average Measurement as below at frequency above 1GHz. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Mode: Transmitting Mode

(Below 1GHz)

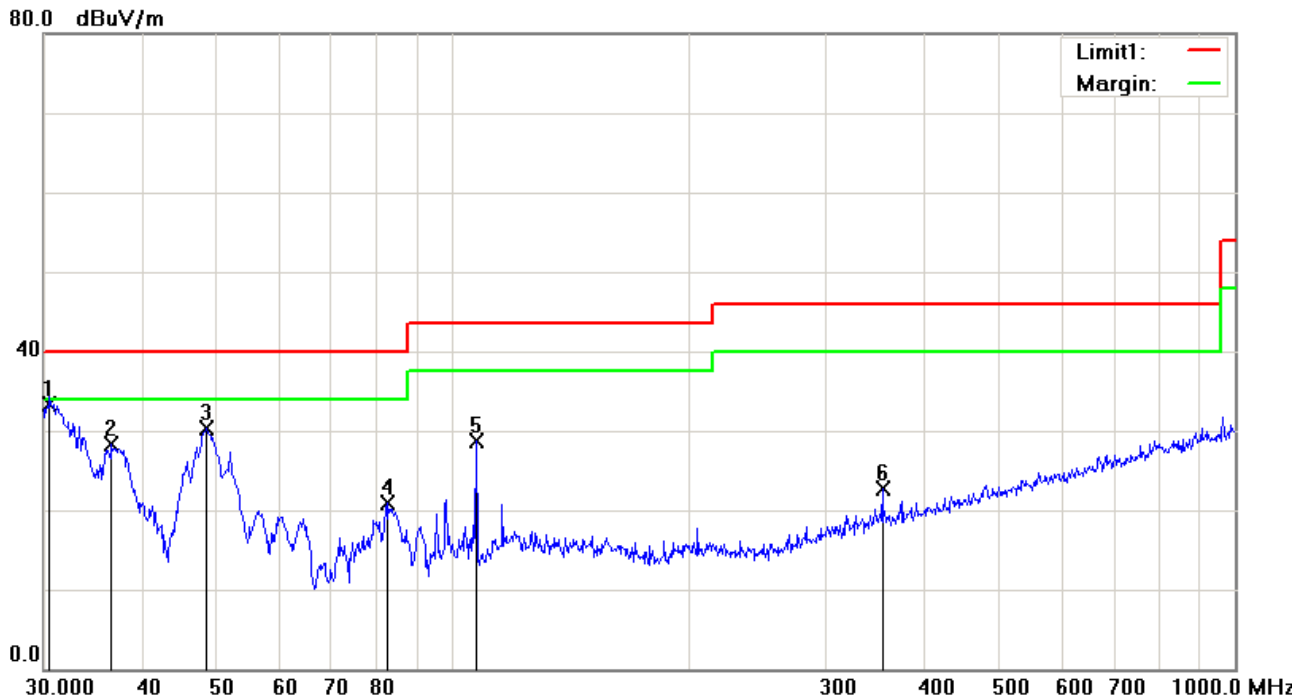


Test Data

Vertical Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	V	30.6379	24.79	peak	-0.73	24.06	40.00	-15.94	100	61
2	V	48.8429	30.15	peak	-12.66	17.49	40.00	-22.51	100	214
3	V	83.5222	29.98	peak	-13.58	16.40	40.00	-23.60	100	155
4	V	187.0958	30.41	peak	-9.42	20.99	43.50	-22.51	100	312
5	V	354.1831	27.69	peak	-5.36	22.33	46.00	-23.67	100	87
6	V	919.2866	25.68	peak	4.87	30.55	46.00	-15.45	100	12

(Below 1GHz)



Test Data

Horizontal Polarity Plot @3m

No	P/L	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Height	Degree
1	H	30.5306	33.93	peak	-0.66	33.27	40.00	-6.73	100	175
2	H	36.6375	33.50	peak	-5.14	28.36	40.00	-11.64	100	205
3	H	48.5016	42.74	peak	-12.50	30.24	40.00	-9.76	100	246
4	H	82.6482	34.44	peak	-13.62	20.82	40.00	-19.18	100	194
5	H	107.1337	38.25	peak	-9.52	28.73	43.50	-14.77	100	216
6	H	354.1831	28.03	peak	-5.36	22.67	46.00	-23.33	100	115

Test Mode:	Transmitting Mode
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Low Channel (2412 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4824	37.93	AV	V	34	6.86	31.72	47.07	54	-6.93
4824	37.19	AV	H	33.8	6.86	31.72	46.13	54	-7.87
4824	47.52	PK	V	34	6.86	31.72	56.66	74	-17.34
4824	47.17	PK	H	33.8	6.86	31.72	56.11	74	-17.89

Middle Channel (2437 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4874	38.15	AV	V	33.6	6.82	31.82	46.75	54	-7.25
4874	37.92	AV	H	33.8	6.82	31.82	46.72	54	-7.28
4874	46.77	PK	V	33.6	6.82	31.82	55.37	74	-18.63
4874	46.51	PK	H	33.8	6.82	31.82	55.31	74	-18.69

High Channel (2462 MHz)

Frequency (MHz)	S.A. Reading (dBμV)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)
4924	37.94	AV	V	34.6	6.76	31.92	47.38	54	-6.62
4924	37.08	AV	H	34.7	6.76	31.92	46.62	54	-7.38
4924	47.33	PK	V	34.6	6.76	31.92	56.77	74	-17.23
4924	46.91	PK	H	34.7	6.76	31.92	56.45	74	-17.55

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
EMI test receiver	ESCS30	8471241027	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
LISN	ISN T800	34373	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
RF conducted test					
Agilent ESA-E SERIES	E4407B	MY45108319	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Radiated Emissions					
EMI test receiver	ESL6	100262	09/17/2015	09/16/2016	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/20/2014	11/19/2015	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	09/01/2015	08/31/2016	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/25/2015	03/24/2016	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/21/2015	09/20/2016	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/25/2014	09/24/2015	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/26/2014	09/25/2015	<input checked="" type="checkbox"/>

Annex B. EUT and Test Setup Photographs

Annex B.i. Photograph: EUT External Photo



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EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

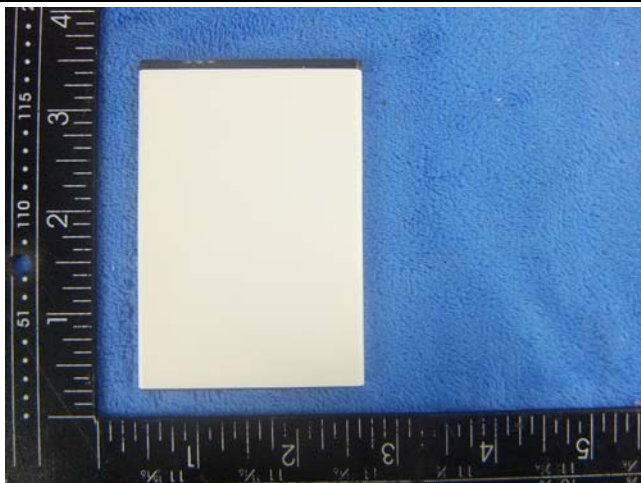
Annex B.ii. Photograph: EUT Internal Photo



Cover Off - Top View 1



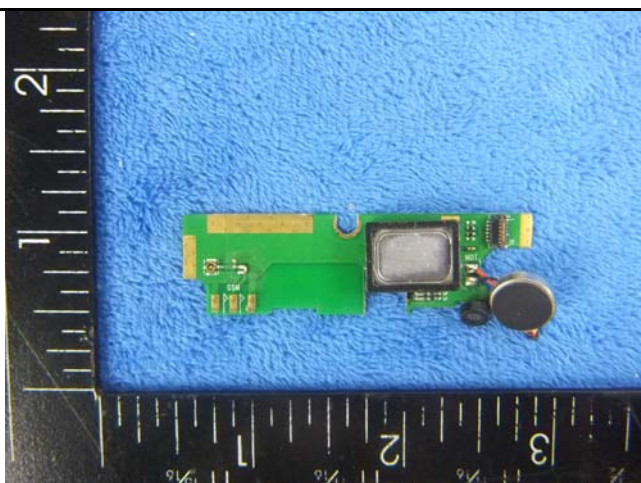
Cover Off - Top View 2



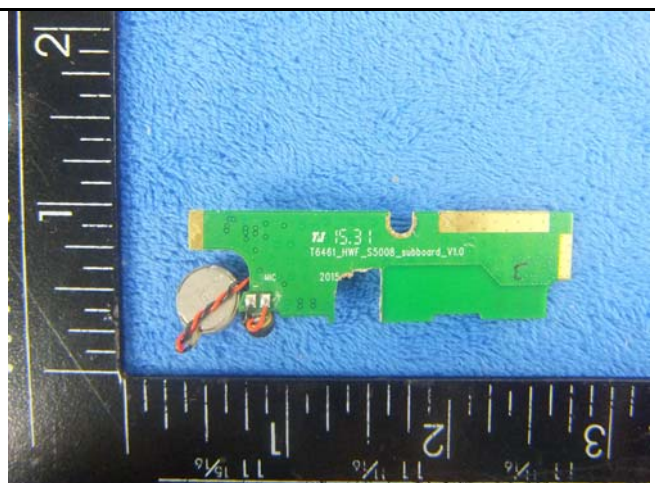
Battery - Front View



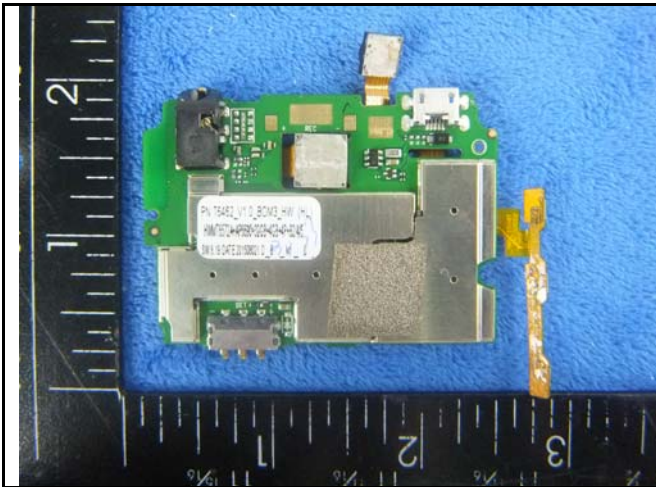
Battery Label - Rear View



Small board - Front View



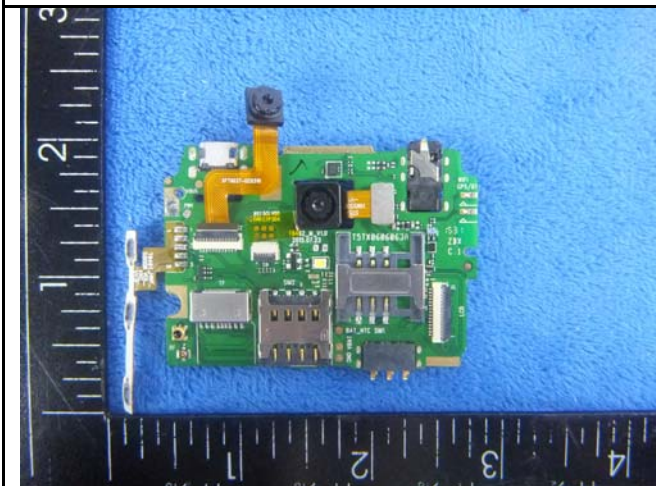
Small board - Rear View



Mainboard With Shielding – Front View



Mainboard Without Shielding - Front View



Mainboard – Rear View



LCD – Front View



LCD – Rear View



GSM/PCS/UMTS-FDD Antenna View

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WIFI/BT/BLE/GPS - Antenna View

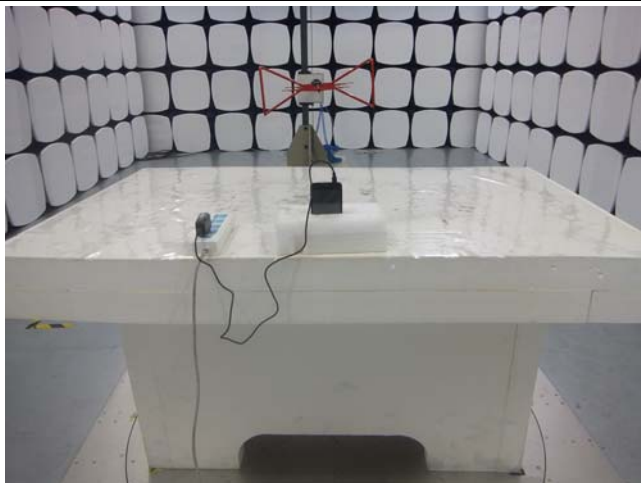
Annex B.iii. Photograph: Test Setup Photo



Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

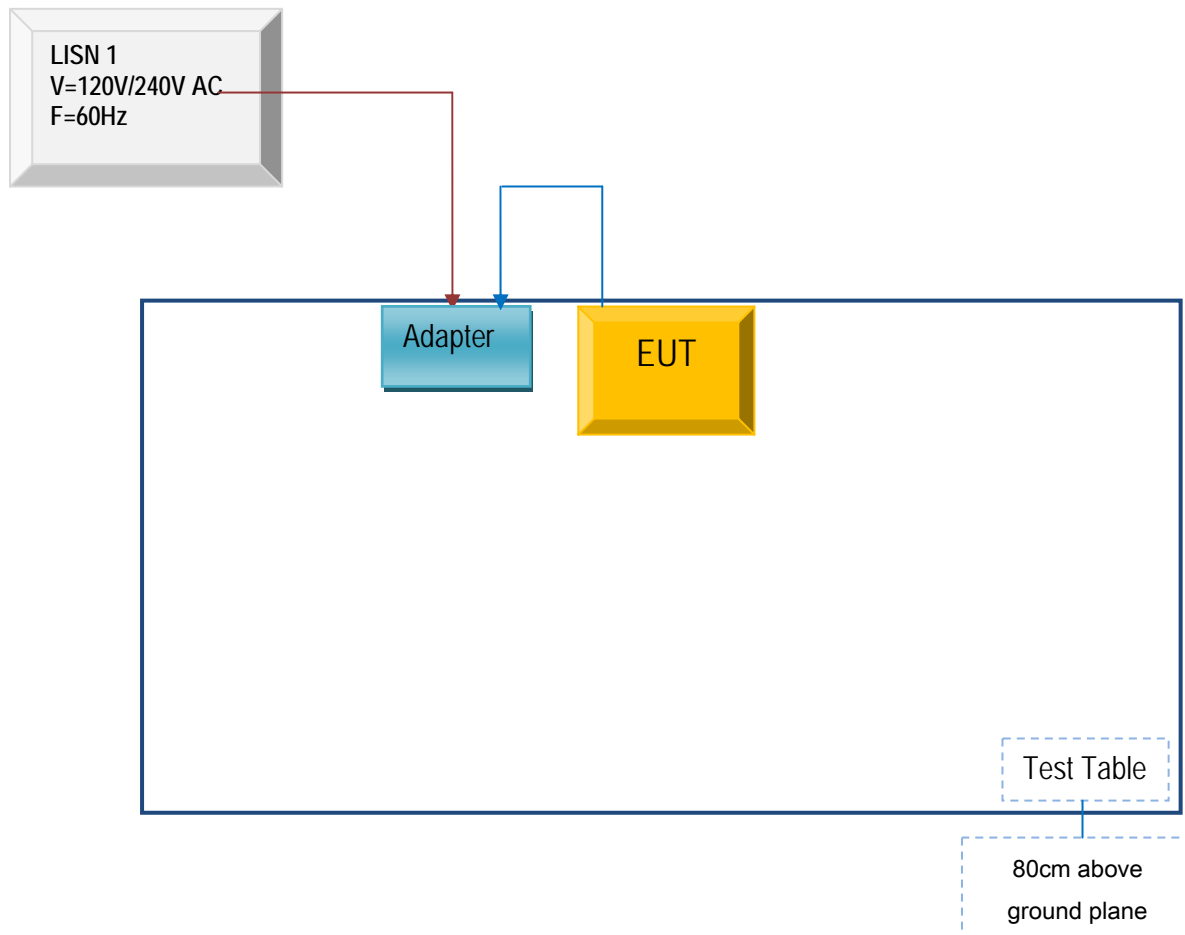


Radiated Spurious Emissions Test Setup Above
1GHz

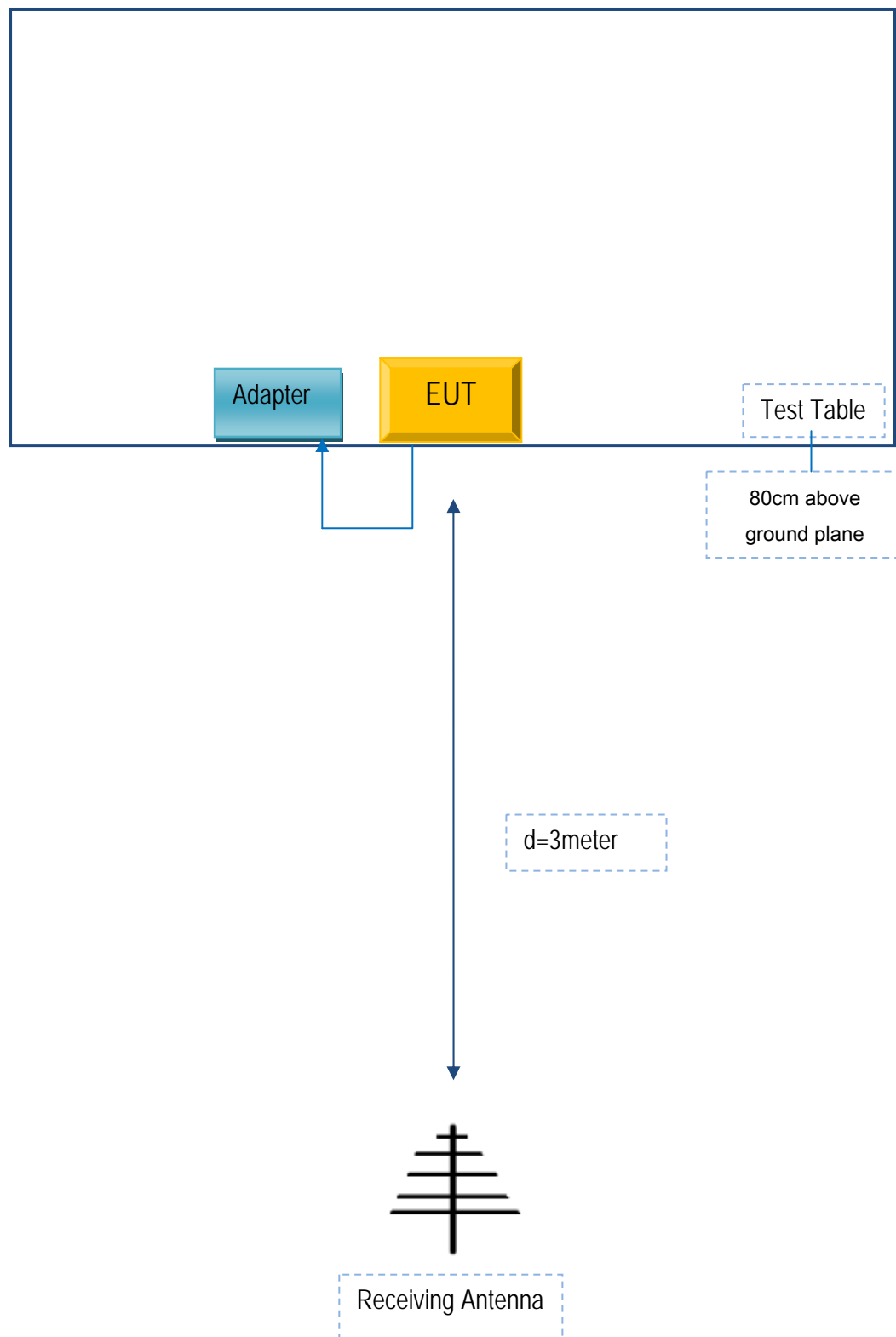
Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

Annex C.ii. TEST SET UP BLOCK

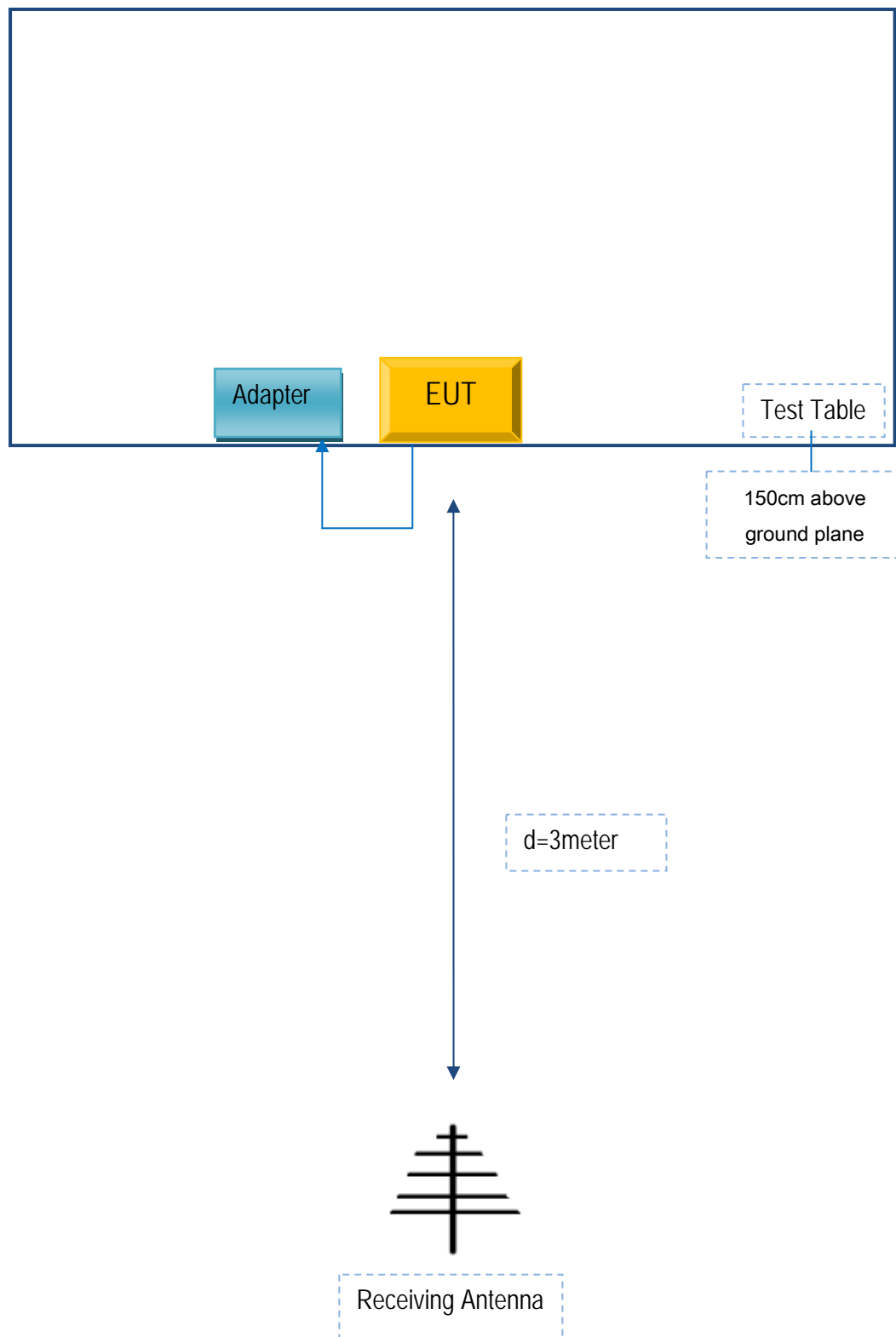
Block Configuration Diagram for AC Line Conducted Emissions



Block Configuration Diagram for Radiated Emissions (Below 1GHz) .



Block Configuration Diagram for Radiated Emissions (Above 1GHz) .



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Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

Manufacturer	Equipment Description	Model	Calibration Date	Calibration Due Date
N/A	N/A	N/A	N/A	N/A

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Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

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Annex E. DECLARATION OF SIMILARITY

N/A