

# RF TEST REPORT



Report No.: 15070008-FCC-R3

Supersede Report No.: N/A

Applicant	Verykool USA Inc	
Product Name	Mobile Phone	
Model No.	s5014	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2014, ANSI C63.10: 2009	
Test Date	January 14 to January 19, 2015	
Issue Date	January 21, 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>Alex Liu</i>	
Winnie Zhang Test Engineer	Alex Liu 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

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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
15070008-FCC-R3	NONE	Original	January 21, 2015

## 2. Customer information

Applicant Name	Verykool USA Inc
Applicant Add	3636 Nobel Drive, Suite 325, San Diego, CA 92122, USA
Manufacturer	BIRD SUIZHOU ELECTRIC CO.,LTD.
Manufacturer Add	NO.1, BIRD ROAD, E.T.DEVELOPMENT ZONE, SUIZHOU CITY, HUBEI 441300, CHINA

## 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	Labview of SIEMIC version 2.0

## 4. Equipment under Test (EUT) Information

Description of EUT:	Mobile Phone
Main Model:	s5014
Serial Model:	N/A
Date EUT received:	January 12, 2015
Test Date(s):	January 14 to January 19, 2015
Equipment Category :	DTS
Antenna Gain:	GSM850: -1 dBi PCS1900: -1 dBi UMTS-FDD Band V: -1 dBi UMTS-FDD Band II: 0 dBi UMTS-FDD Band IV: 0 dBi Bluetooth/BLE: 1 dBi WIFI: 1 dBi
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK, 8PSK UMTS-FDD: QPSK, 16QAM 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, $\pi$ /4DQPSK, 8DPSK BLE: GFSK
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 II TX: 1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz UMTS-FDD Band IV TX : 1712.4 ~ 1752.6 MHz; RX : 2112.4 ~ 2152.6 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz WIFI: 802.11n(40M): 2422-2452 MHz Bluetooth & BLE: 2402-2480 MHz

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**Max. Output Power:** 802.11b: 9.43 dBm  
 802.11g: 9.54 dBm  
 802.11n(20M): 9.63 dBm  
 802.11n(40M): 9.07 dBm

**Number of Channels:** GSM 850: 124CH  
 PCS1900: 299CH  
 UMTS-FDD Band V : 102CH  
 UMTS-FDD Band II : 277CH  
 UMTS-FDD Band IV: 202CH  
 WIFI :802.11b/g/n(20M): 11CH  
 WIFI :802.11n(40M): 7CH  
 Bluetooth: 79CH  
 BLE: 40CH

**Port:** Power Port, Earphone Port, USB Port

**Input Power:** Battery:  
 Model: BH-L4Pi  
 Spec: 3.7V 1900mAh  
 Limited charger voltage: 4.2V  
 Adapter:  
 Model: SC050100-US  
 Input: AC 100-240V; 50/60Hz 0.4A  
 Output: DC 5.0V; 1000mA

**Trade Name :** verykool

**GPRS/EGPRS Multi-slot class** 8/10/12

**FCC ID:** WA6S5014

## 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, the gain is 1 dBi for Bluetooth/BLE/WIFI.

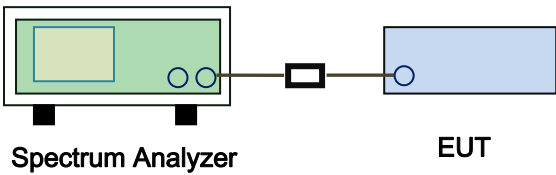
A permanently attached PIFA antenna for GSM and UMTS, the gain is -1 dBi for GSM850/PCS1900/UMTS-FDD Band V, 0 dBi for UMTS-FDD Band II /UMTS-FDD Band IV.

**The antenna meets up with the ANTENNA REQUIREMENT.**

**Result:** Compliance.

## 6.2 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1009mbar
Test date :	January 14, 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"> <li>a) Set RBW = 100 kHz.</li> <li>b) Set the video bandwidth (VBW) ≥ 3 × RBW.</li> <li>c) Detector = Peak.</li> <li>d) Trace mode = max hold.</li> <li>e) Sweep = auto couple.</li> <li>f) Allow the trace to stabilize.</li> <li>g) 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.</li> </ol> <p><u>20dB bandwidth</u></p> <p>C63.10 Occupied Bandwidth (OBW=20dB bandwidth)</p> <ol style="list-style-type: none"> <li>1. Set RBW = 1%-5% OBW.</li> <li>2. Set the video bandwidth (VBW) ≥ 3 x RBW.</li> <li>3. Set the span range between 2 times and 5 times of the OBW.</li> <li>4. Sweep time=Auto, Detector=PK, Trace=Max hold.</li> <li>5. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce the worst-</li> </ol>		

	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

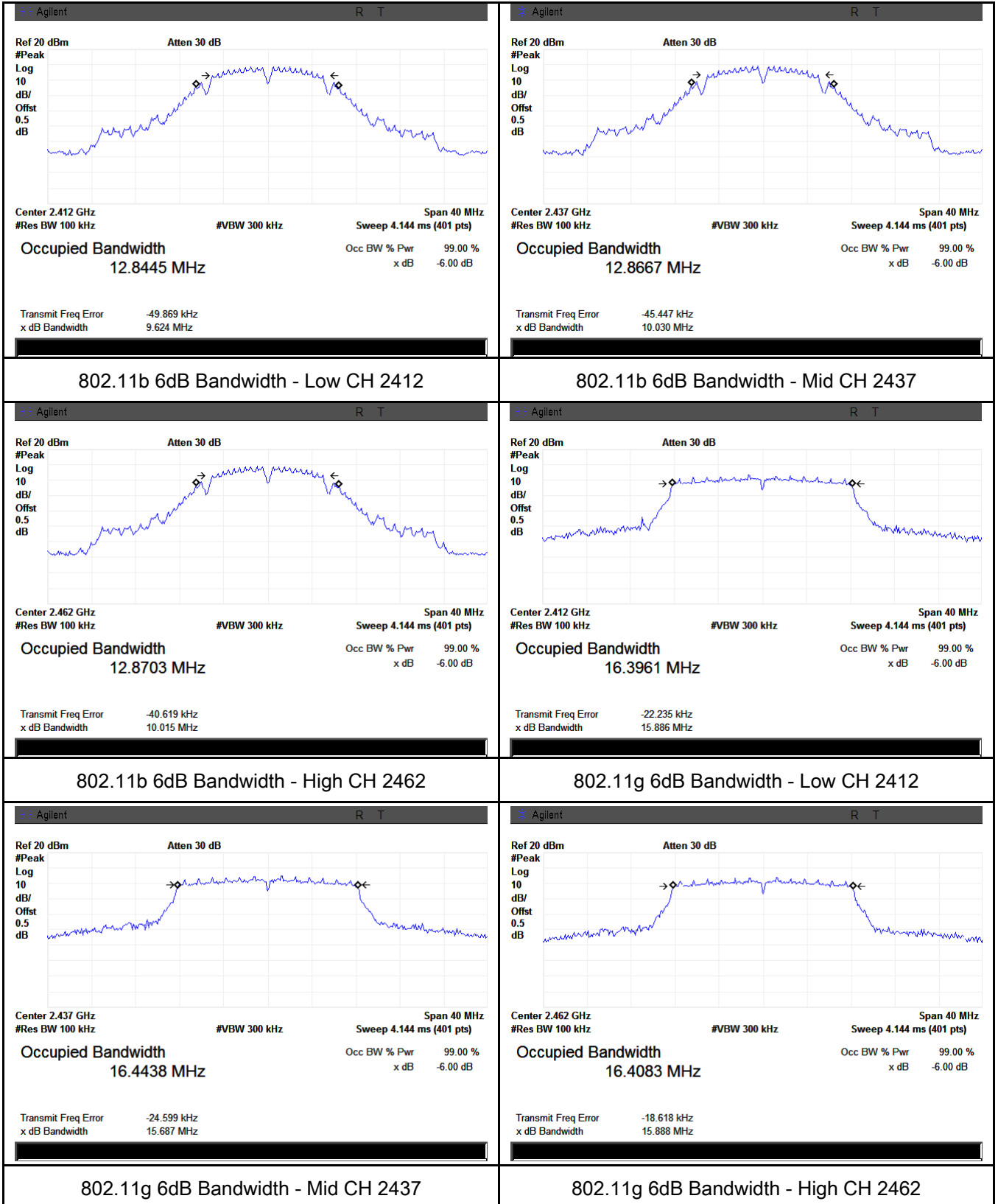
Test Plot  Yes (See below)  N/A

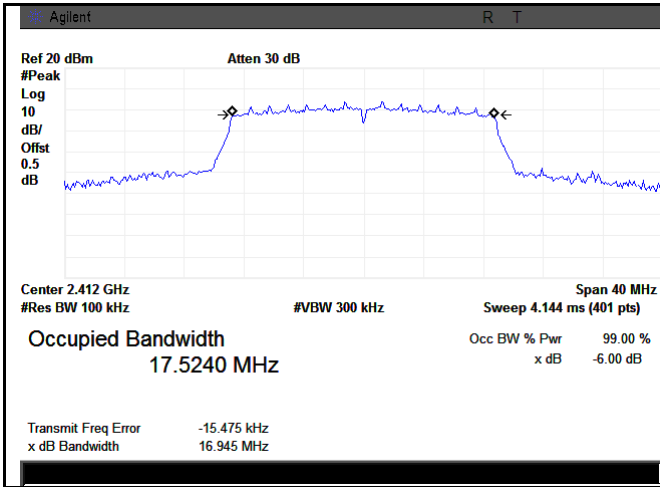
### Measurement result

Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	9.624	15.060	≥ 0.5
	Mid	2437	10.030	15.143	≥ 0.5
	High	2462	10.015	15.145	≥ 0.5
802.11g	Low	2412	15.886	19.018	≥ 0.5
	Mid	2437	15.687	18.943	≥ 0.5
	High	2462	15.888	18.888	≥ 0.5
802.11n (20M)	Low	2412	16.945	19.411	≥ 0.5
	Mid	2437	17.001	19.356	≥ 0.5
	High	2462	16.332	19.345	≥ 0.5
802.11n (40M)	Low	2422	35.619	38.264	≥ 0.5
	Mid	2437	35.481	38.251	≥ 0.5
	High	2452	35.414	38.340	≥ 0.5

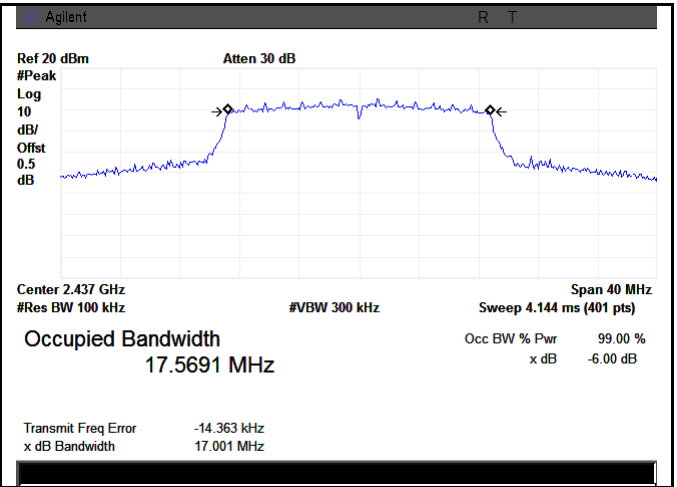
## Test Plots

### 6dB Bandwidth measurement result

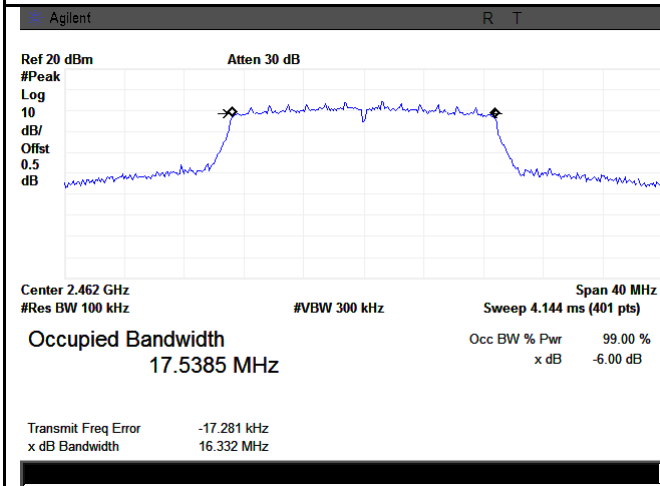




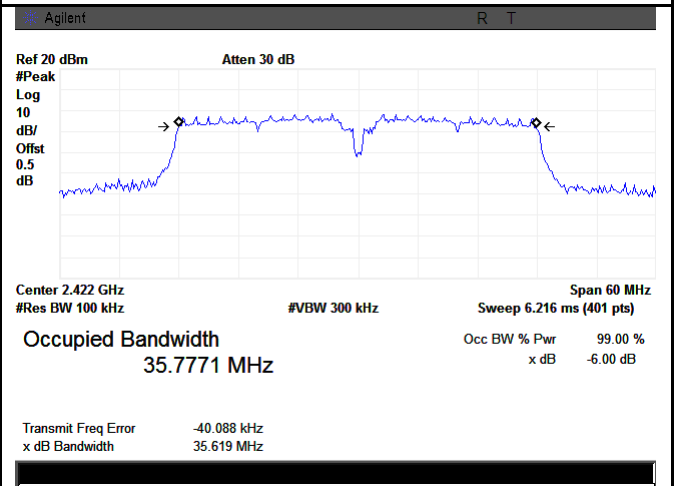
802.11n20 6dB Bandwidth - Low CH 2412



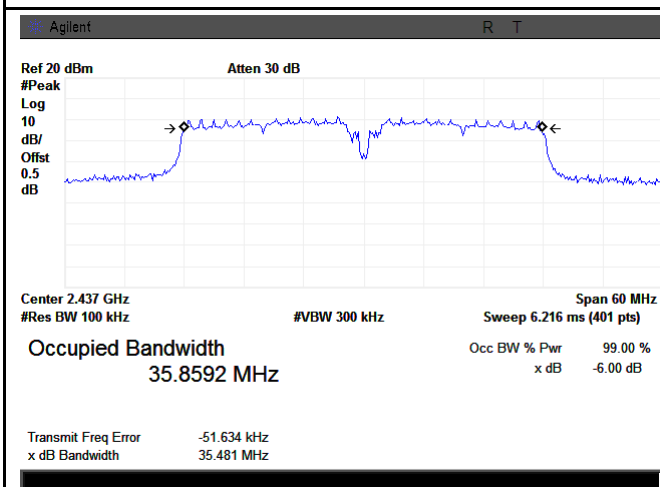
802.11n20 6dB Bandwidth - Mid CH 2437



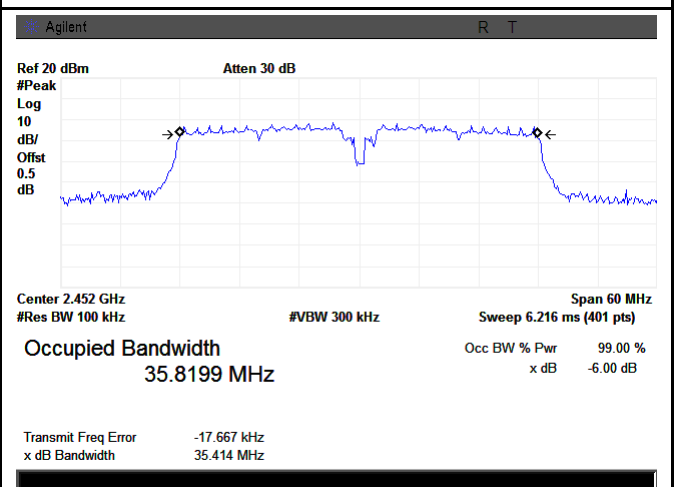
802.11n20 6dB Bandwidth - High CH 2462



802.11n40 6dB Bandwidth - Low CH 2422

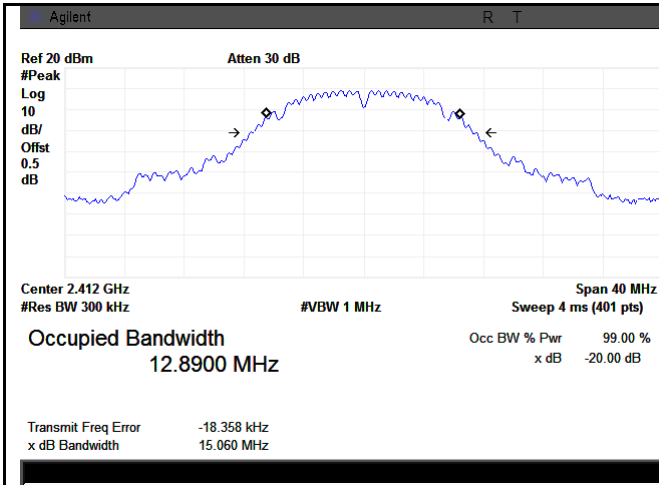


802.11n40 6dB Bandwidth - Mid CH 2437

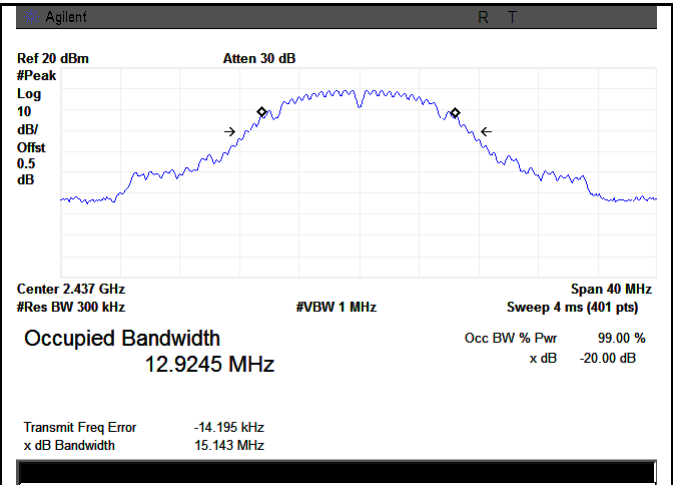


802.11n40 6dB Bandwidth - High CH 2452

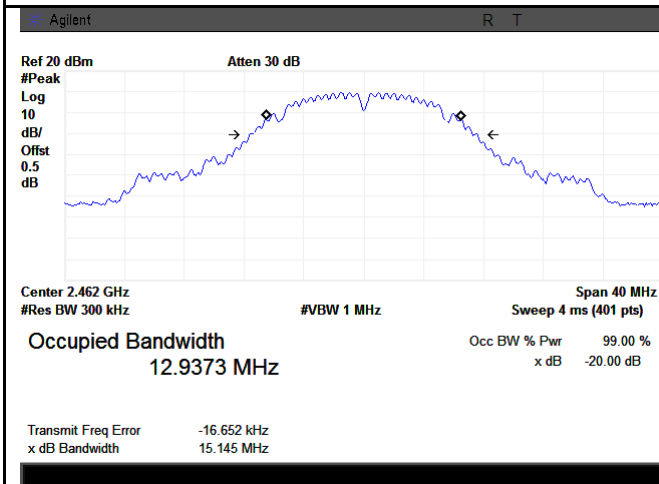
## 20 dB Bandwidth measurement result



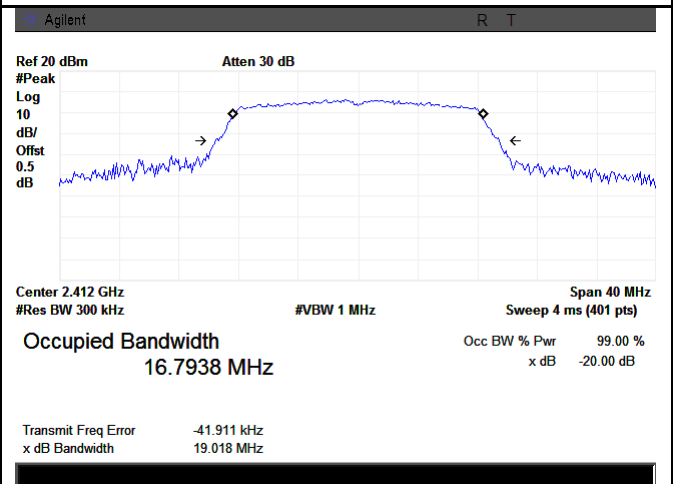
802.11b 20dB Bandwidth - Low CH 2412



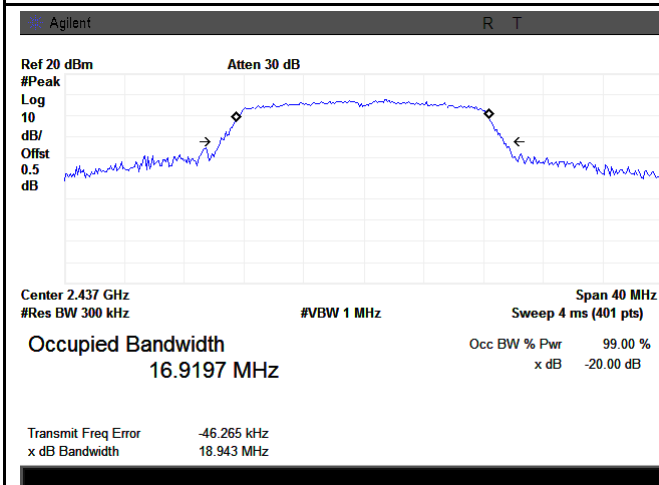
802.11b 20dB Bandwidth - Mid CH 2437



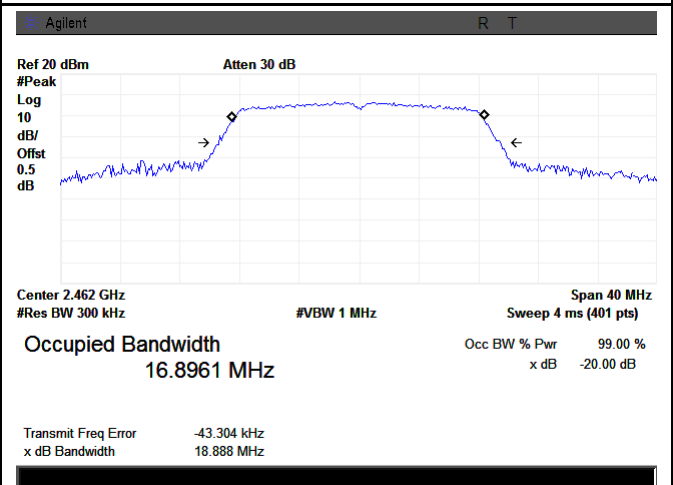
802.11b 20dB Bandwidth - High CH 2462



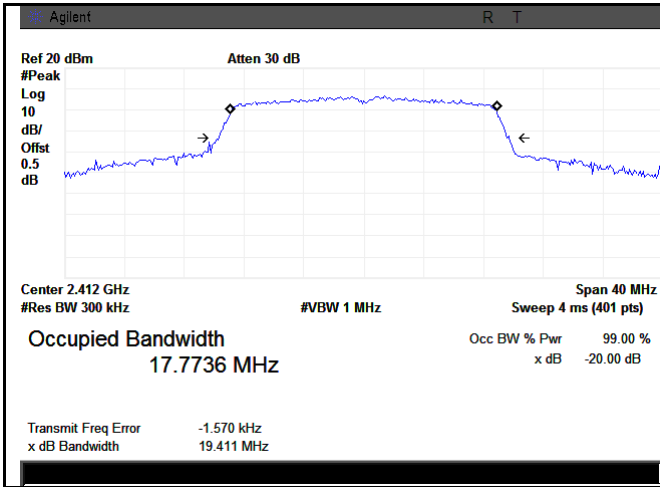
802.11g 20dB Bandwidth - Low CH 2412



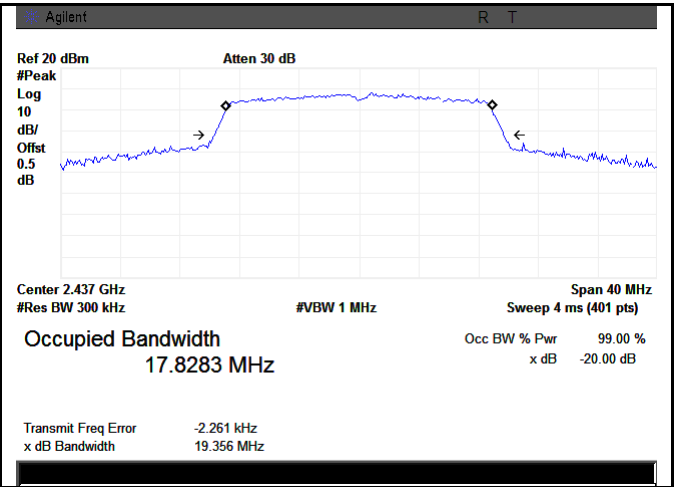
802.11g 20dB Bandwidth - Mid CH 2437



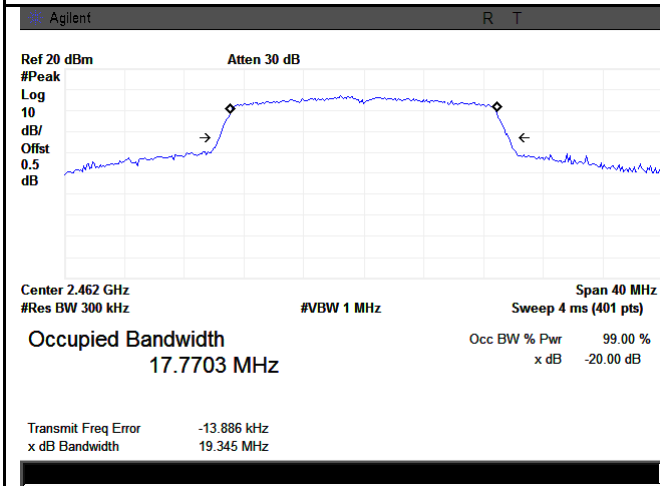
802.11g 20dB Bandwidth - High CH 2462



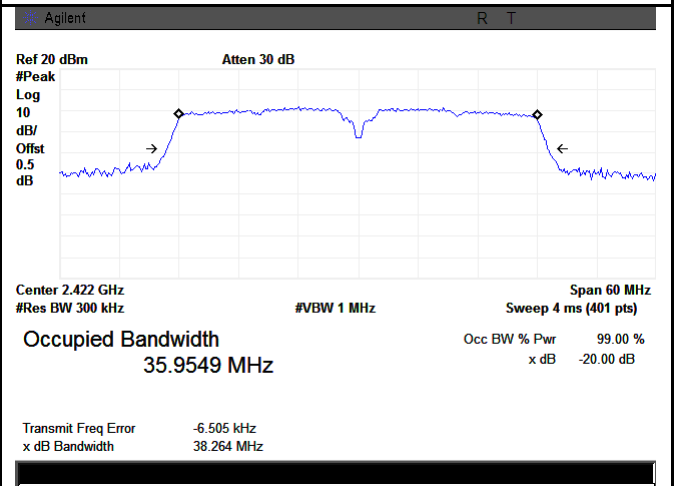
802.11n20 20dB Bandwidth - Low CH 2412



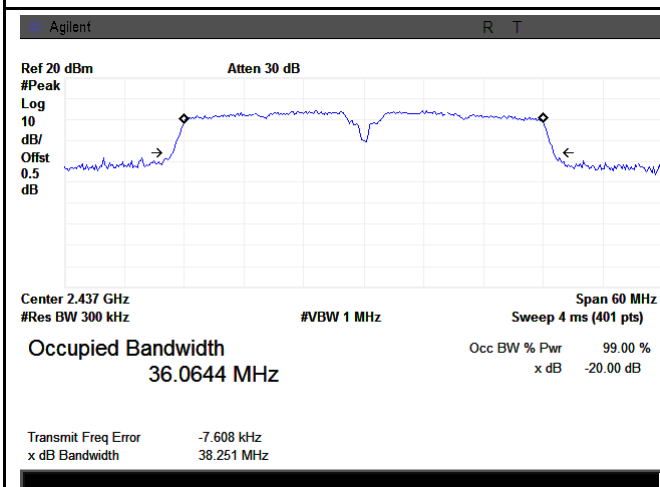
802.11n20 20dB Bandwidth - Mid CH 2437



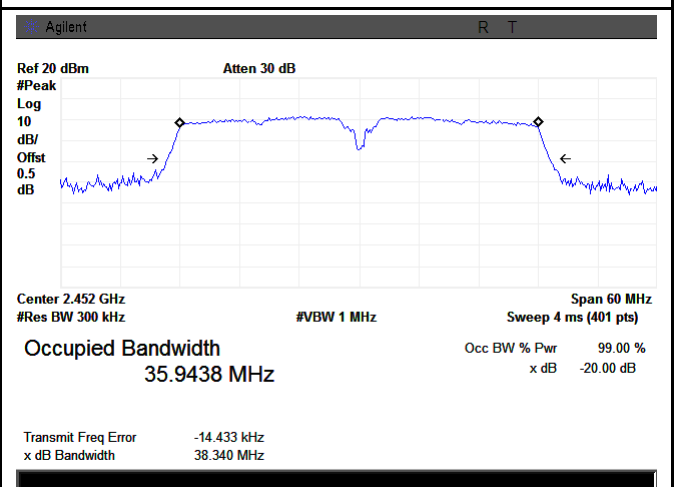
802.11n20 20dB Bandwidth - High CH 2462



802.11n40 20dB Bandwidth - Low CH 2422



802.11n40 20dB Bandwidth - Mid CH 2437



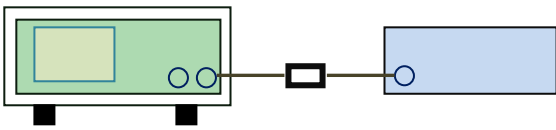
802.11n40 20dB Bandwidth - High CH 2452

### 6.3 Maximum Output Power

Temperature	21°C
Relative Humidity	58%
Atmospheric Pressure	1009mbar
Test date :	January 14, 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 $\geq 75$ channels: $\leq 1$ Watt	<input type="checkbox"/>
	b)	FHSS in 5725-5850MHz: $\leq 1$ Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: $\leq 0.125$ Watt.	<input type="checkbox"/>
	d)	FHSS in 902-928MHz with $\geq 50$ channels: $\leq 1$ Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with $\geq 25$ & $<50$ channels: $\leq 0.25$ Watt	<input type="checkbox"/>
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: $\leq 1$ Watt	<input checked="" type="checkbox"/>

Test Setup	 <p style="text-align: center;">Spectrum Analyzer                      EUT</p>
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Test Procedure	<p>558074 D01 DTS MEAS Guidance v03r02, 9.1.2 Integrated band power method Maximum output power measurement procedure</p> <ul style="list-style-type: none"> <li>- a) Set span to at least 1.5 times the OBW.</li> <li>- b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.</li> <li>- c) Set VBW <math>\geq 3 \times</math> RBW.</li> <li>- d) Number of points in sweep <math>\geq 2 \times</math> span / RBW. (This gives bin-to-bin spacing <math>\leq</math> RBW/2, so that narrowband signals are not lost between frequency bins.)</li> <li>- e) Sweep time = auto.</li> <li>- f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.</li> <li>- g) If transmit duty cycle <math>&lt; 98</math> %, use a sweep trigger with the level set to enable</li> </ul>
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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 <math>\geq 98\%</math>, 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"> <li>- h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.</li> <li>- 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.</li> </ul>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data  Yes  N/A

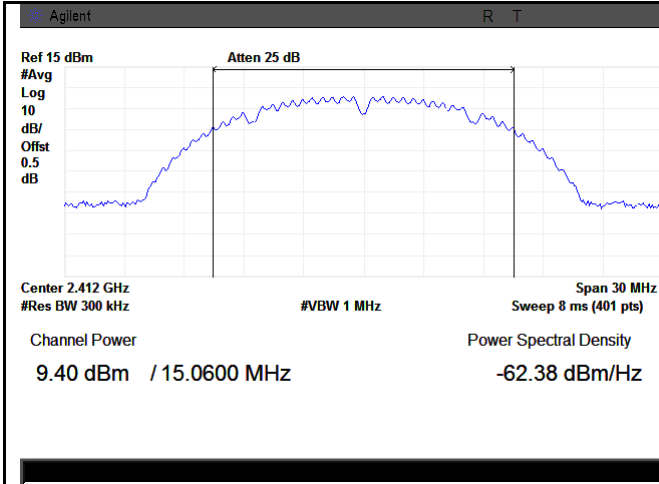
Test Plot  Yes (See below)  N/A

#### Output Power measurement result

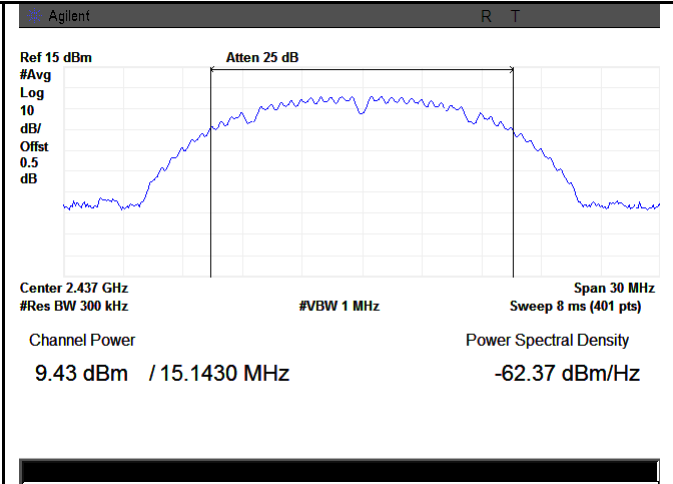
Type	Test mode	CH	Freq (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	9.40	30	Pass
		Mid	2437	<b>9.43</b>	30	Pass
		High	2462	9.33	30	Pass
	802.11g	Low	2412	9.24	30	Pass
		Mid	2437	9.29	30	Pass
		High	2462	<b>9.54</b>	30	Pass
	802.11n (20M)	Low	2412	8.69	30	Pass
		Mid	2437	9.21	30	Pass
		High	2462	<b>9.63</b>	30	Pass
	802.11n (40M)	Low	2422	7.94	30	Pass
		Mid	2437	<b>9.07</b>	30	Pass
		High	2452	8.48	30	Pass

### Test Plots

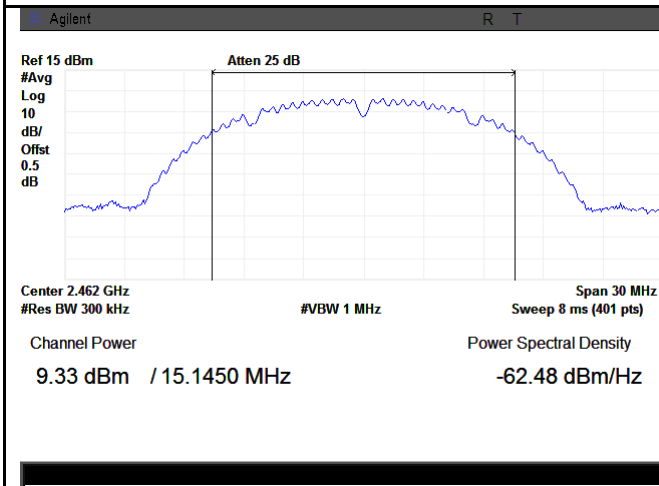
#### The Average Power



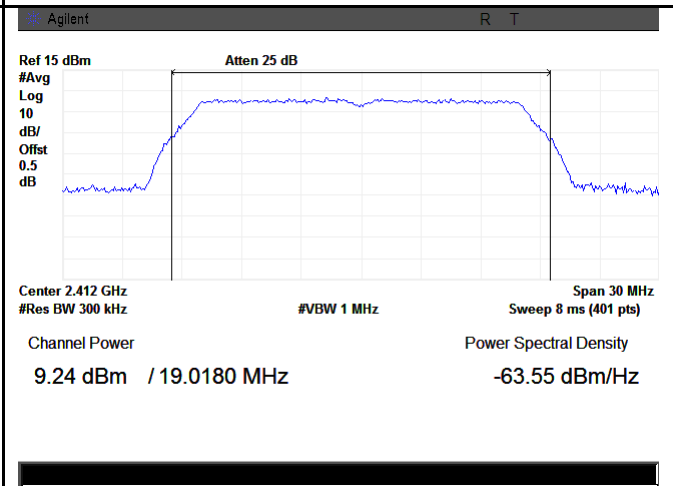
802.11b - AV Output power - Low CH 2412



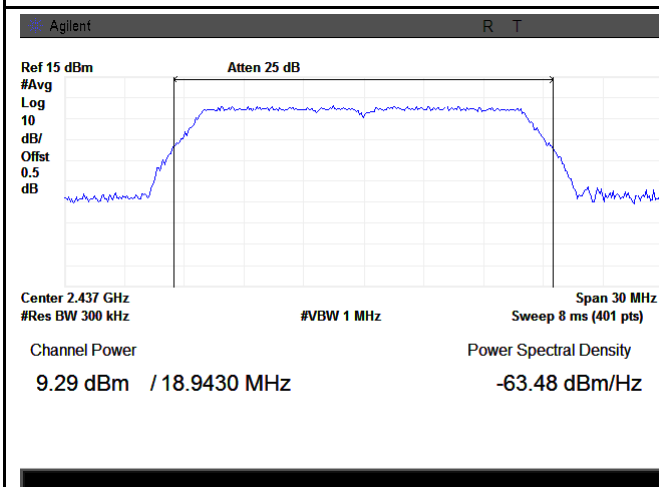
802.11b - AV Output power - Mid CH 2437



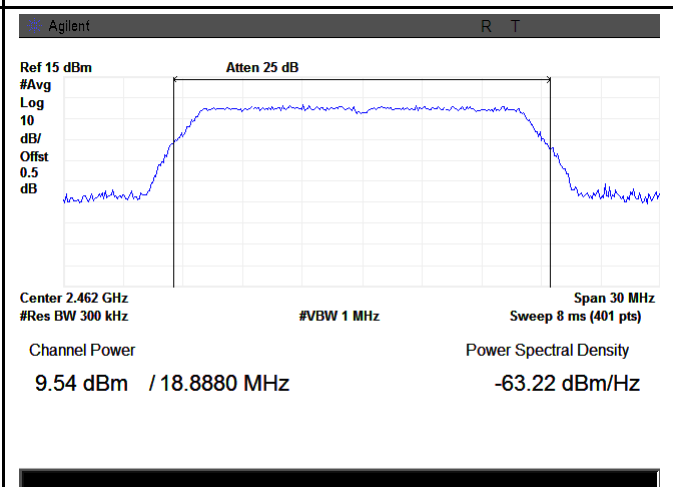
802.11b - AV Output power - High CH 2462



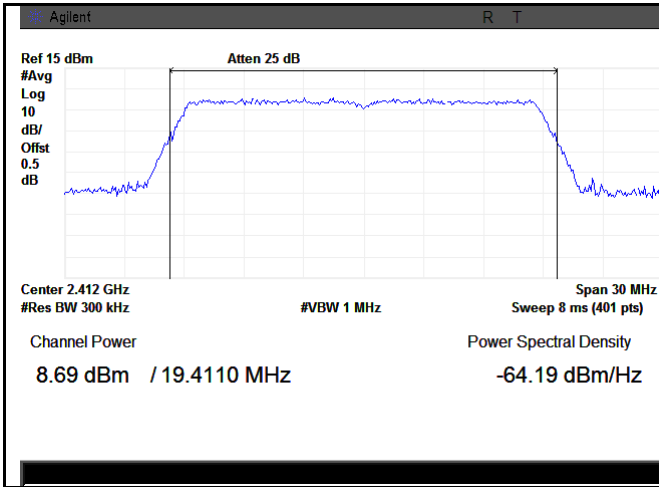
802.11g - AV Output power - Low CH 2412



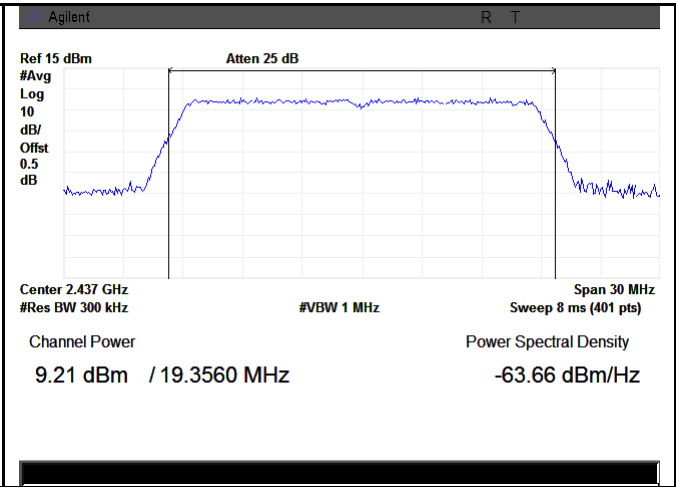
802.11g - AV Output power - Mid CH 2437



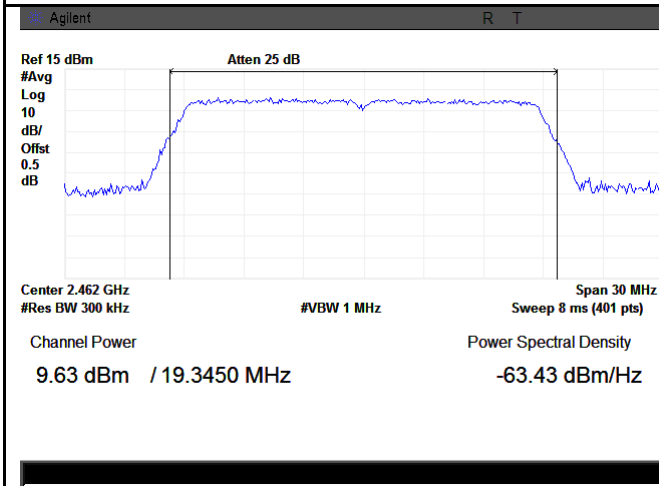
802.11g - AV Output power - High CH 2462



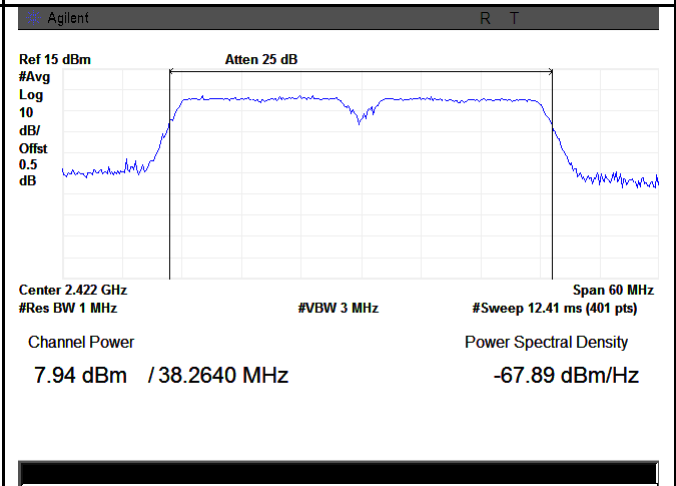
802.11n20 - AV Output power - Low CH 2412



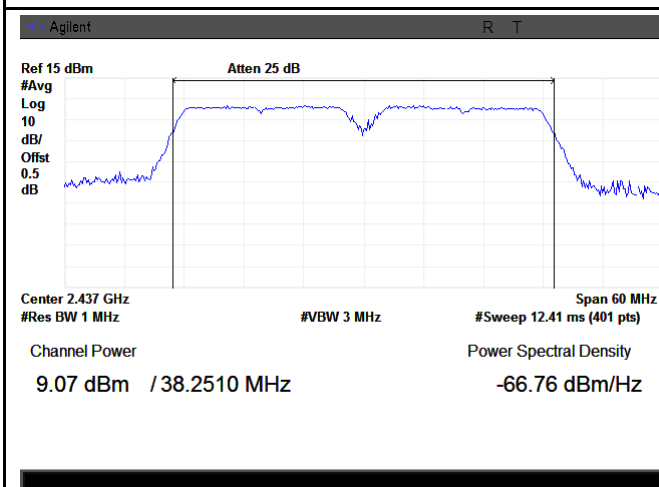
802.11n20 - AV Output power - Mid CH 2437



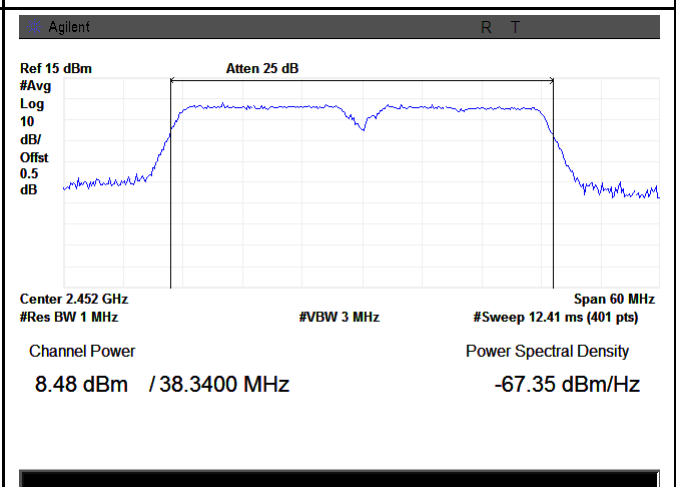
802.11n20 - AV Output power - High CH 2462



802.11n40 - AV Output power - Low CH 2422



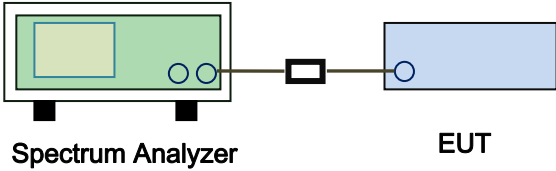
802.11n40 - AV Output power - Mid CH 2437



802.11n40 - AV Output power - High CH 2452

## 6.4 Power Spectral Density

Temperature	22°C
Relative Humidity	58%
Atmospheric Pressure	1009mbar
Test date :	January 15, 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	558074 D01 DTS MEAS Guidance v03r02, 10.2 power spectral density method power spectral density measurement procedure <ul style="list-style-type: none"> <li>- a) Set analyzer center frequency to DTS channel center frequency.</li> <li>- b) Set the span to 1.5 times the DTS bandwidth.</li> <li>- c) Set the RBW to: <math>3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}</math>.</li> <li>- d) Set the VBW <math>\geq 3 \times \text{RBW}</math>.</li> <li>- e) Detector = peak.</li> <li>- f) Sweep time = auto couple.</li> <li>- g) Trace mode = max hold.</li> <li>- h) Allow trace to fully stabilize.</li> <li>- i) Use the peak marker function to determine the maximum amplitude level within the RBW.</li> <li>- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.</li> </ul>		
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

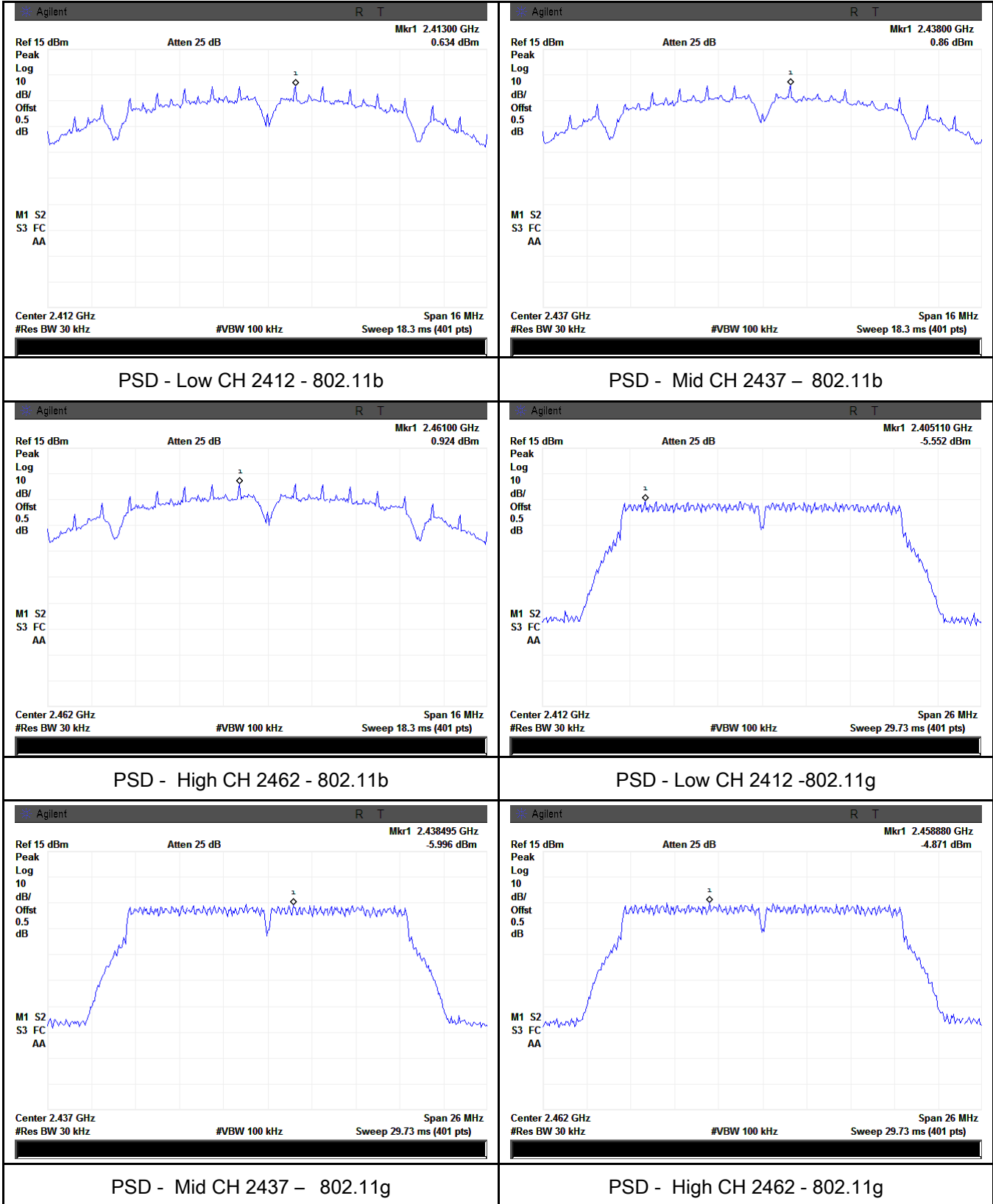
Test Data  Yes  N/A  
 Test Plot  Yes (See below)  N/A

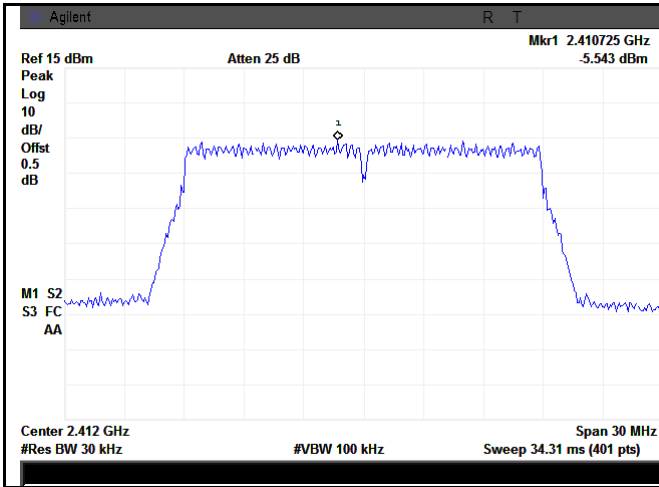
**Power Spectral Density measurement result**

Type	Test mode	CH	Freq (MHz)	PSD (dBm)	Limit (dBm)	Result
PSD	802.11b	Low	2412	0.634	8	Pass
		Mid	2437	0.860	8	Pass
		High	2462	0.924	8	Pass
	802.11g	Low	2412	-5.552	8	Pass
		Mid	2437	-5.996	8	Pass
		High	2462	-4.871	8	Pass
	802.11n (20M)	Low	2412	-5.543	8	Pass
		Mid	2437	-5.303	8	Pass
		High	2462	-5.079	8	Pass
	802.11n (40M)	Low	2422	-4.302	8	Pass
		Mid	2437	-4.165	8	Pass
		High	2452	-3.839	8	Pass

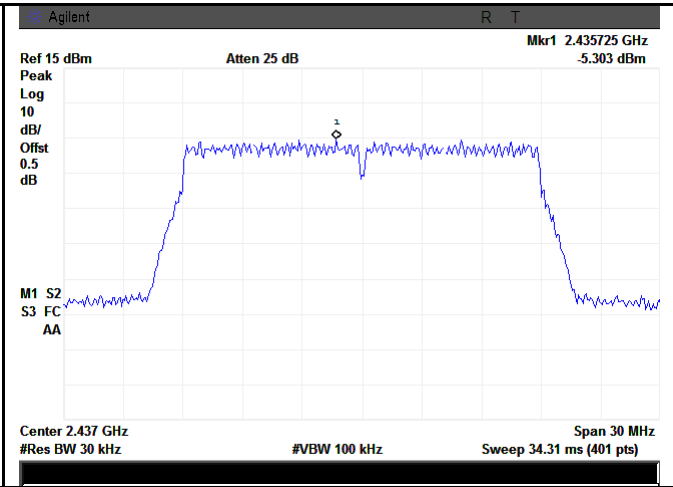
**Test Plots**

**Power Spectral Density measurement result**

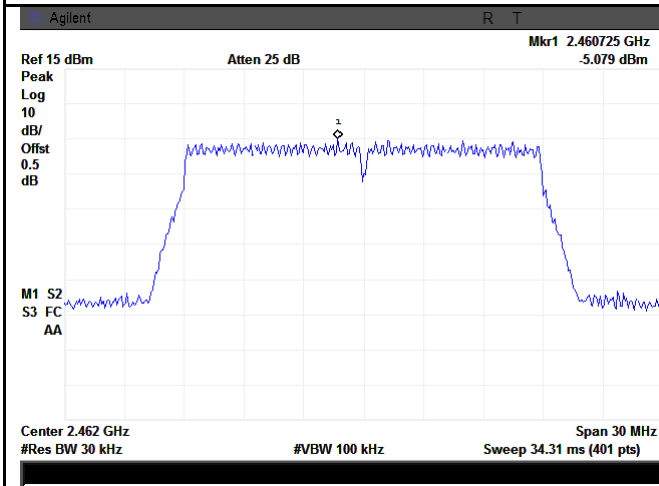




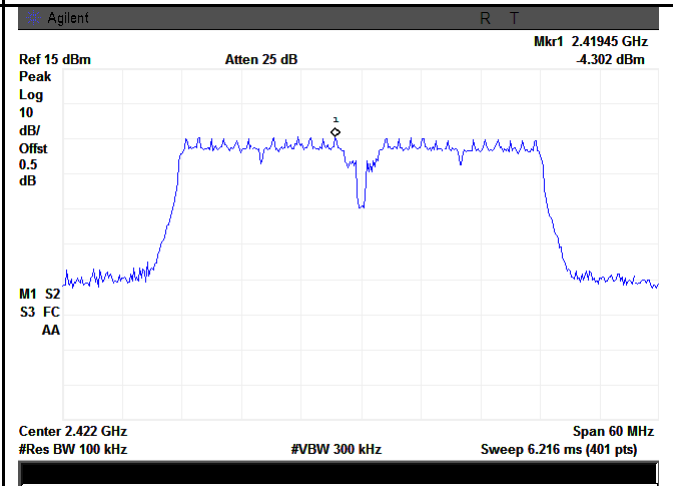
PSD - Low CH 2412 - 802.11n20



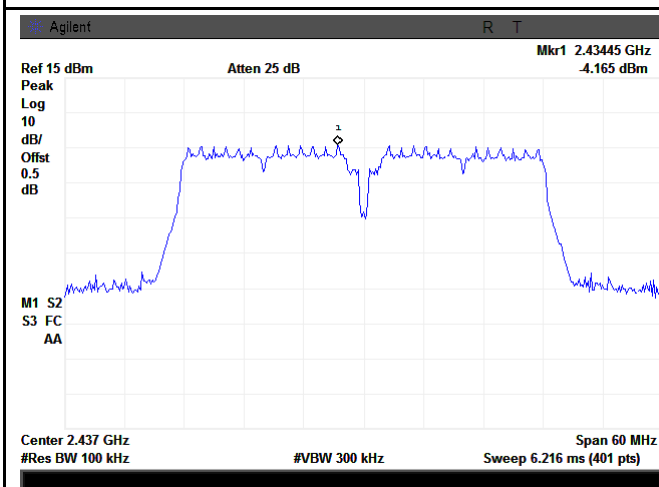
PSD - Mid CH 2437 - 802.11n20



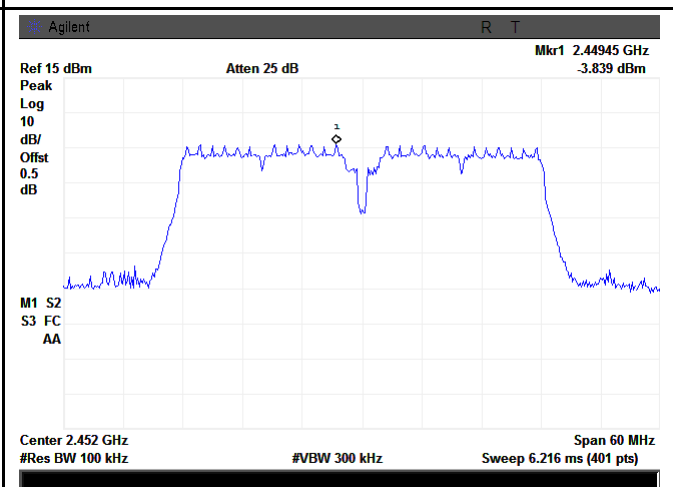
PSD - High CH 2462 - 802.11n20



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	22°C
Relative Humidity	58%
Atmospheric Pressure	1009mbar
Test date :	January 15, 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	<p>The diagram illustrates the test setup for radiated emissions. It features a turn table on a ground plane. On the turn table, there are EUT &amp; Support Units. A distance of 3m is indicated between the EUT and an antenna tower. The antenna tower has a 1-4m variable height. A test receiver is connected to the antenna tower.</p>
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Test Procedure	<p>Radiated Method Only</p> <ul style="list-style-type: none"> <li>- 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.</li> <li>- 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.</li> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge,</li> </ul>
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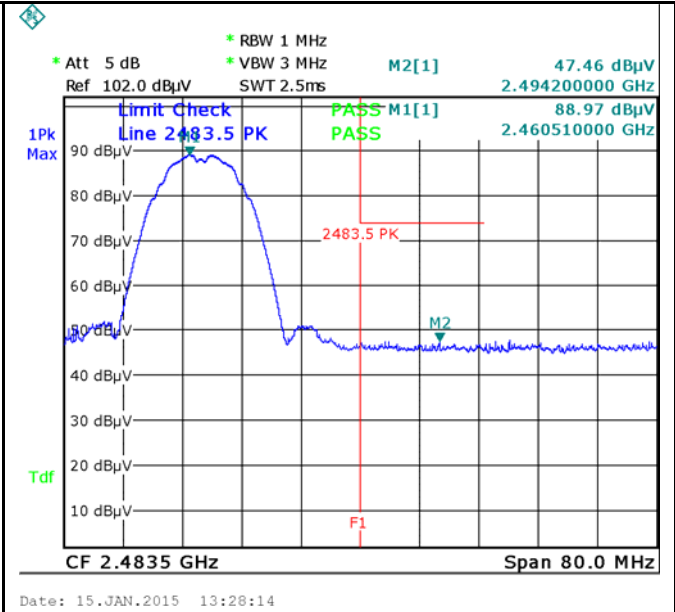
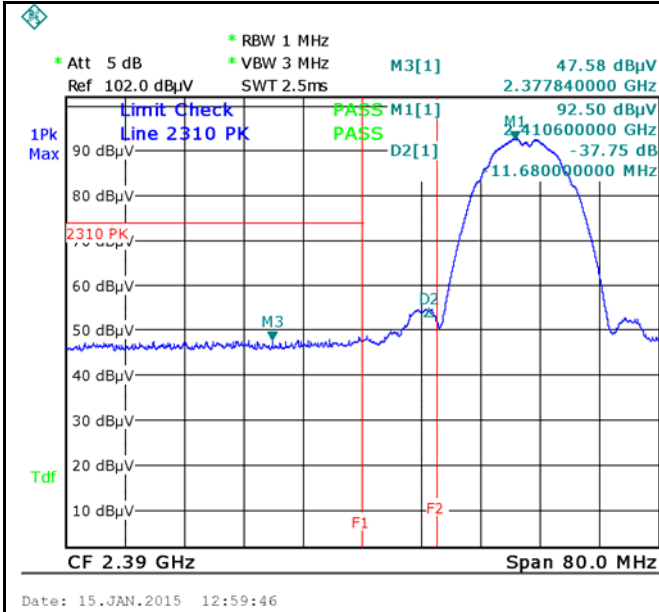
	<p>check the emission of EUT, if pass then set Spectrum Analyzer as below:</p> <p>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</p> <p>b. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz 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"> <li>- 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.</li> <li>- 5. Repeat above procedures until all measured frequencies were complete.</li> </ul>
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data     Yes                       N/A

Test Plot      Yes (See below)             N/A

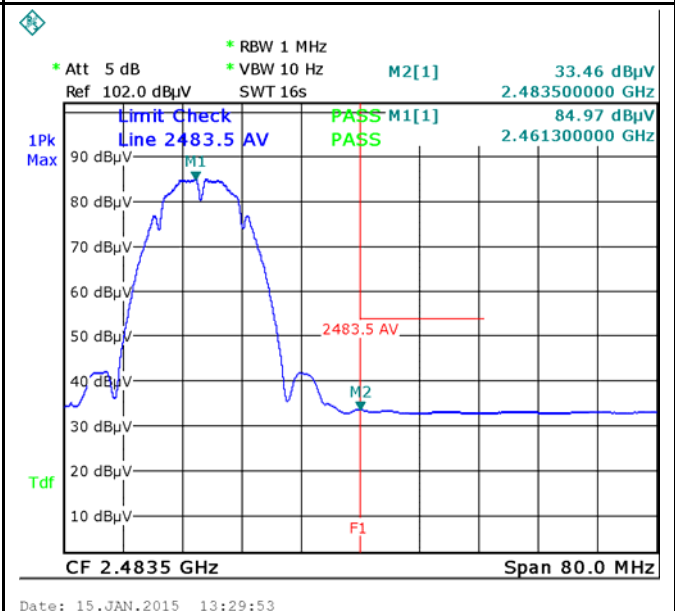
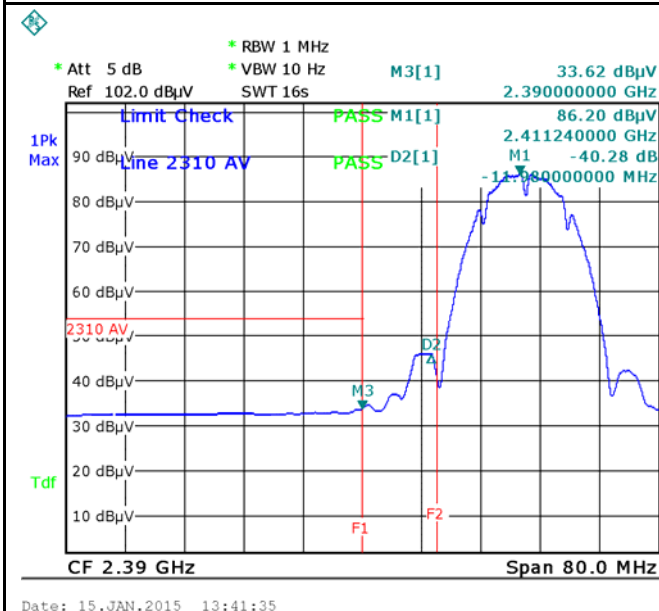
**Test Plots**

**Band Edge measurement result**



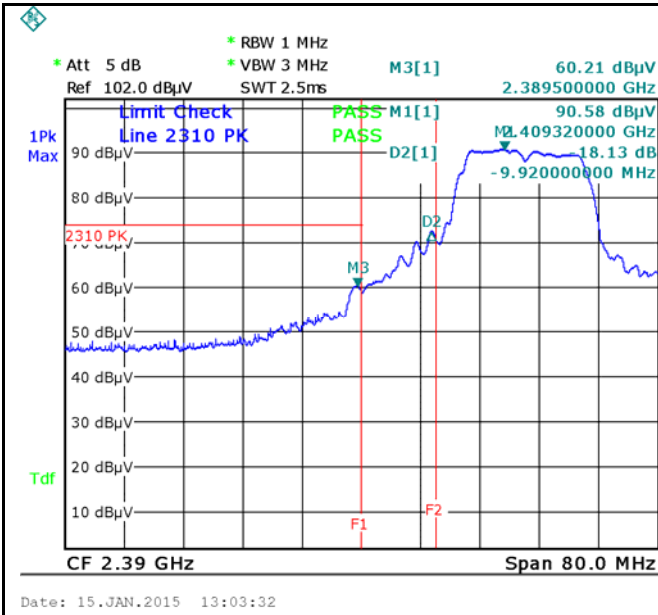
Band Edge, Left Side (Peak) - 802.11b

Band Edge, Right Side (Peak) - 802.11b

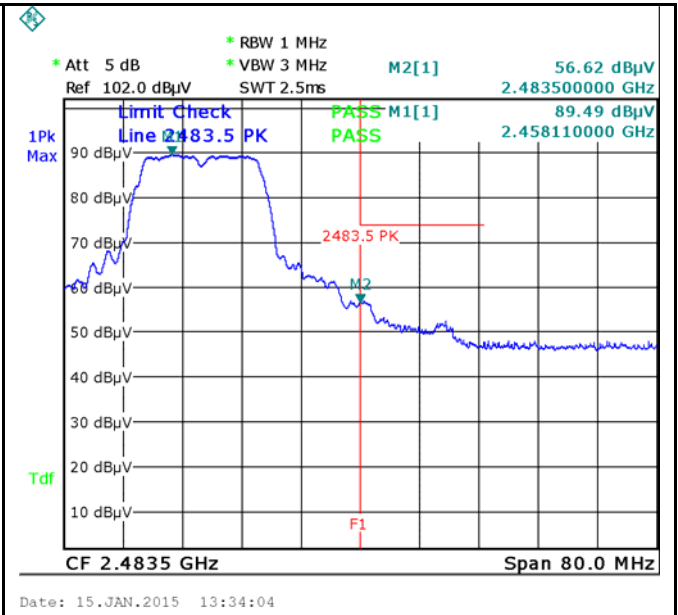


Band Edge, Left Side (Average) - 802.11b

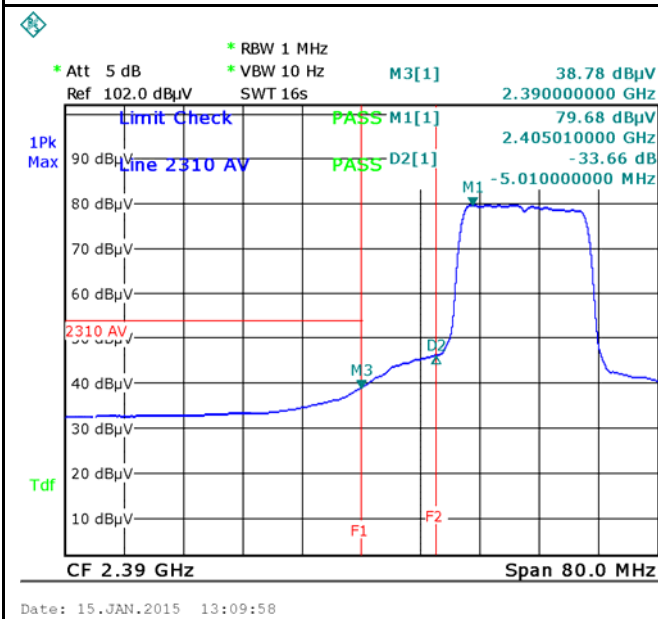
Band Edge, Right Side (Average) - 802.11b



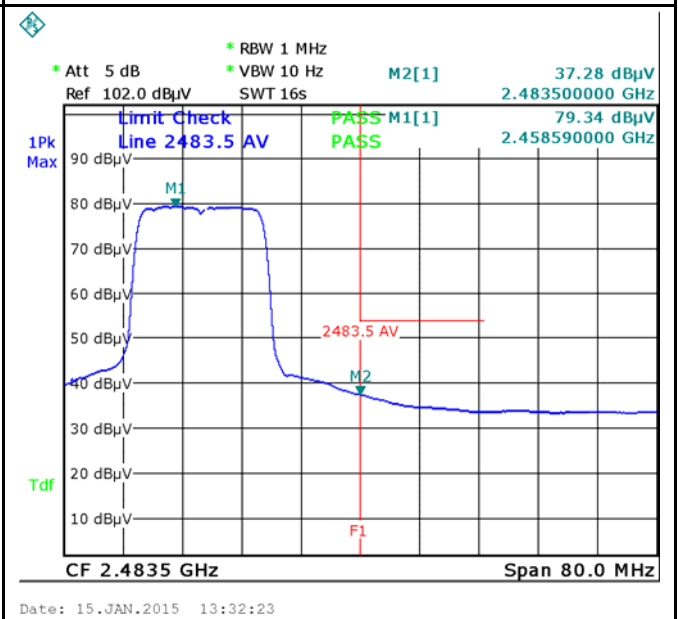
Band Edge, Left Side (Peak) - 802.11g



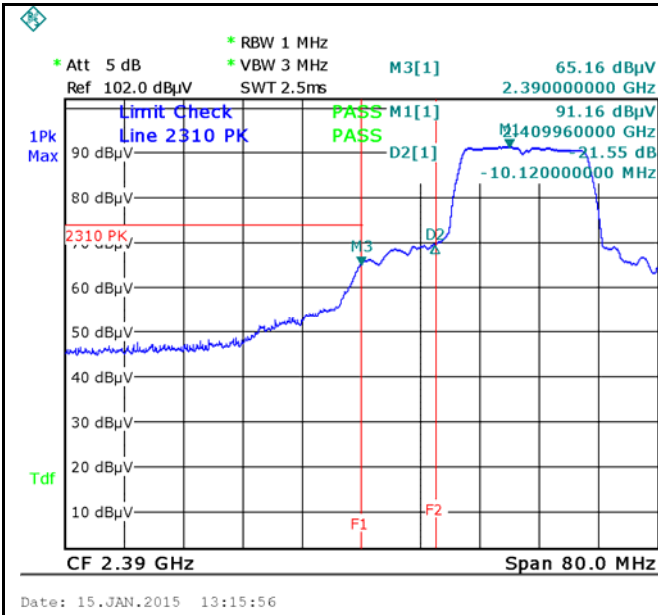
Band Edge, Right Side (Peak) - 802.11g



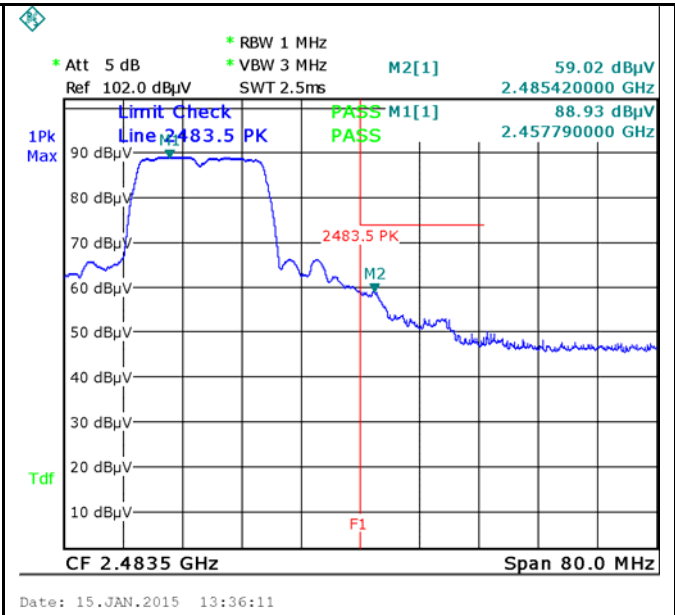
Band Edge, Left Side (Average) - 802.11g



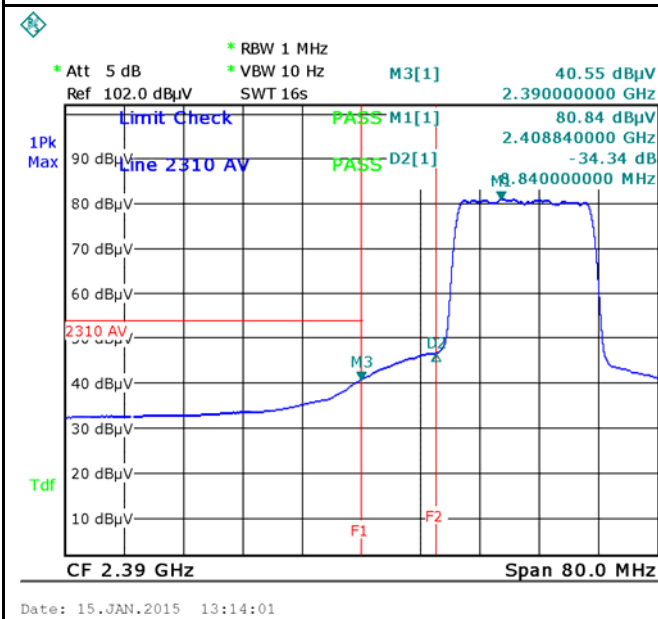
Band Edge, Right Side (Average) - 802.11g



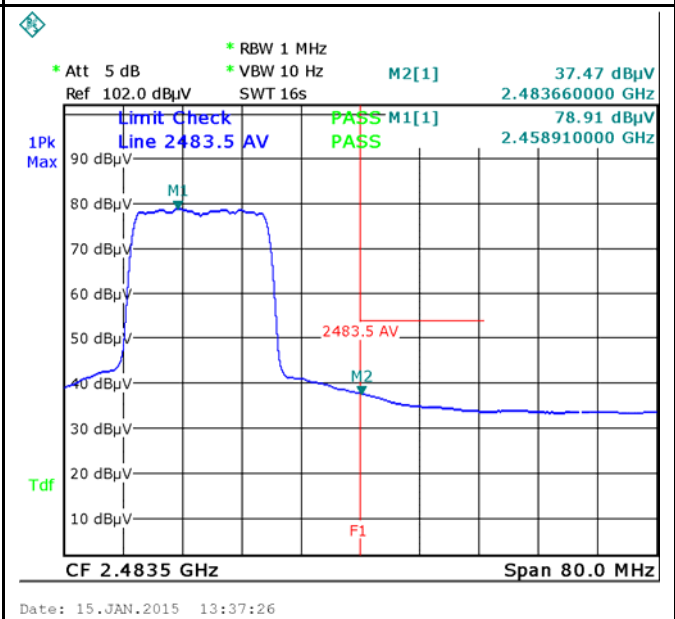
Band Edge, Left Side (Peak) - 802.11n20



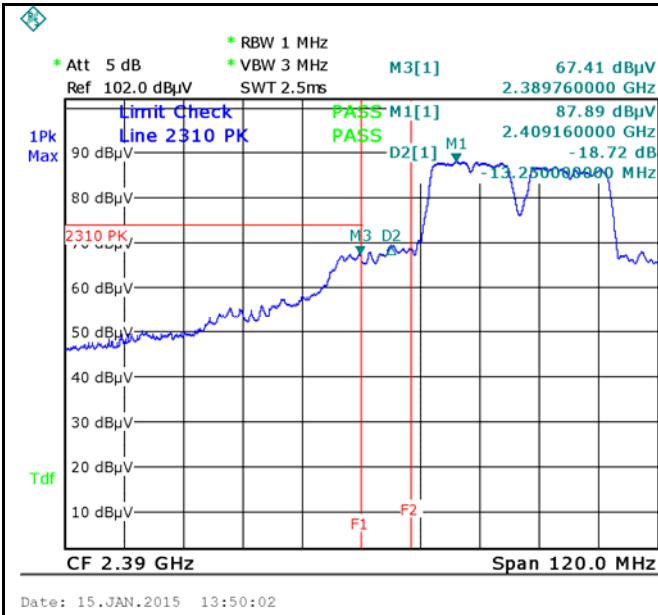
Band Edge, Right Side (Peak) - 802.11n20



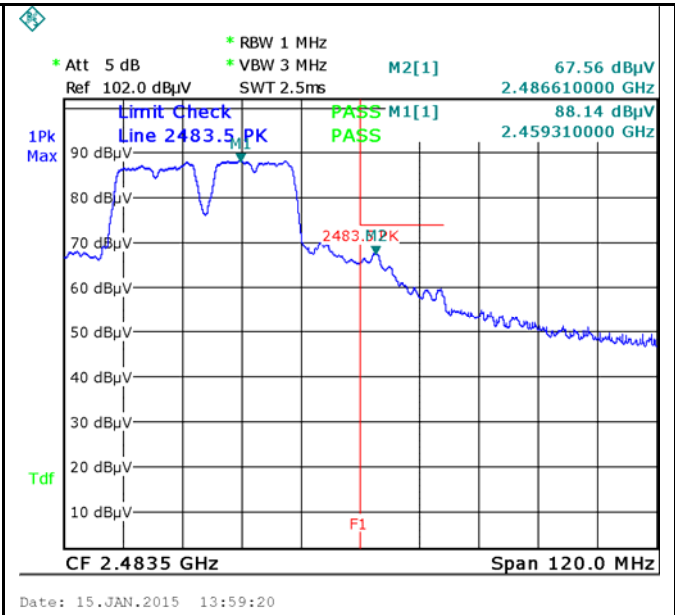
Band Edge, Left Side (Average) - 802.11n20



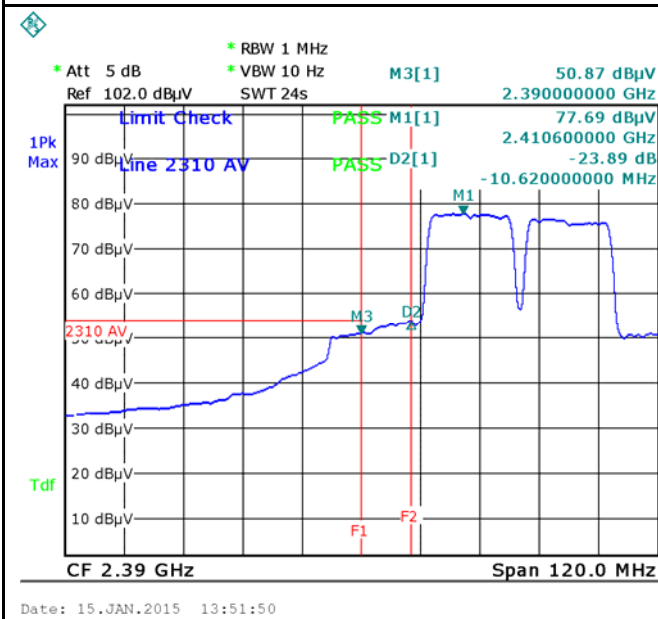
Band Edge, Right Side (Average) - 802.11n20



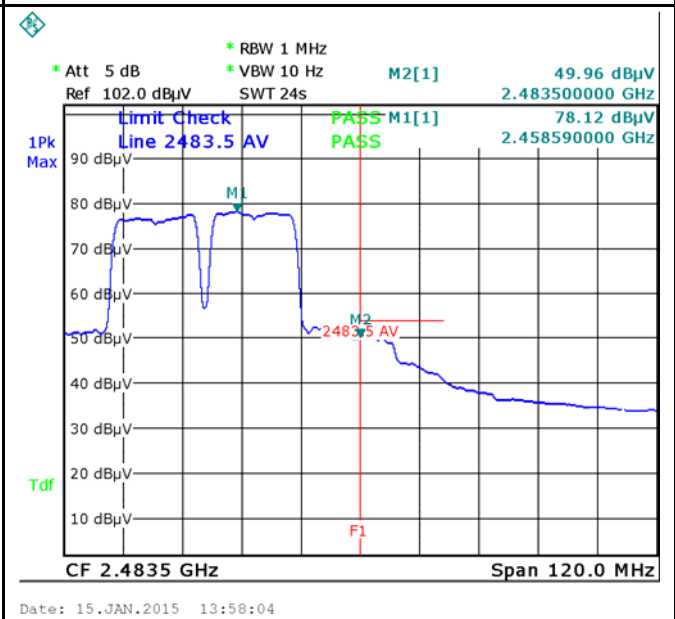
Band Edge, Left Side (Peak) - 802.11n40



Band Edge, Right Side (Peak) - 802.11n40



Band Edge, Left Side (Average) - 802.11n40



Band Edge, Right Side (Average) - 802.11n40

## 6.6 AC Power Line Conducted Emissions

Temperature	19°C
Relative Humidity	60%
Atmospheric Pressure	1011mbar
Test date :	January 19, 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 [μ] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.	<input checked="" type="checkbox"/>														
		<table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dBμV)</th> </tr> <tr> <th>QP</th> <th>Average</th> </tr> </thead> <tbody> <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> </tbody> </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	<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>
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Procedure	<ol style="list-style-type: none"> <li>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.</li> <li>The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains.</li> <li>The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss</li> </ol>
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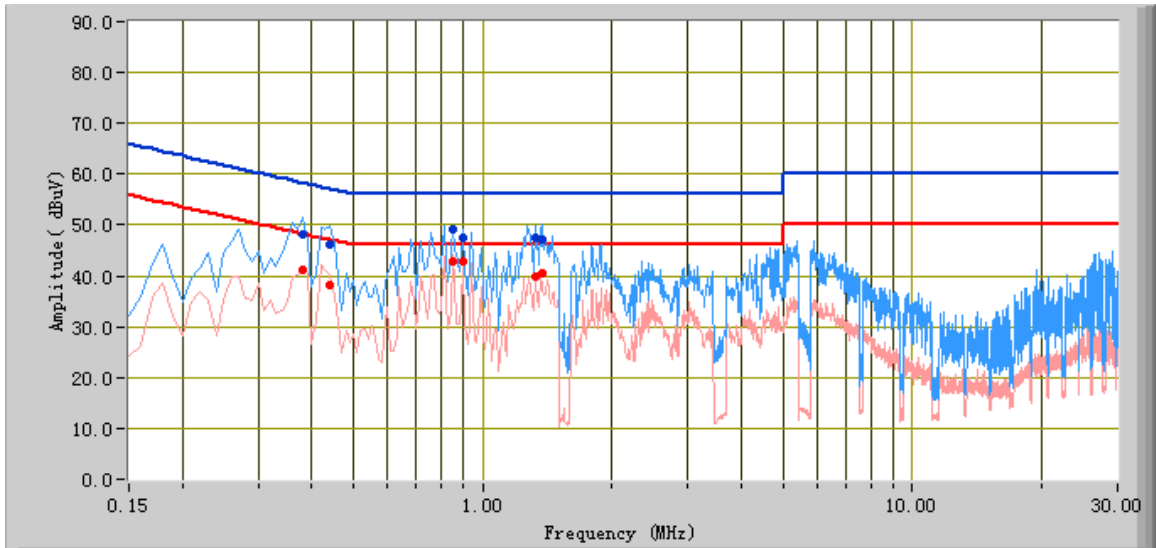
	<p>coaxial cable.</p> <ol style="list-style-type: none"> <li>4. All other supporting equipment were powered separately from another main supply.</li> <li>5. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>6. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.</li> <li>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.</li> <li>8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).</li> </ol>
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

**Peak Detector**     **Quasi Peak Limit**      
**Average Detector**     **Average Limit**    



**Test Data**

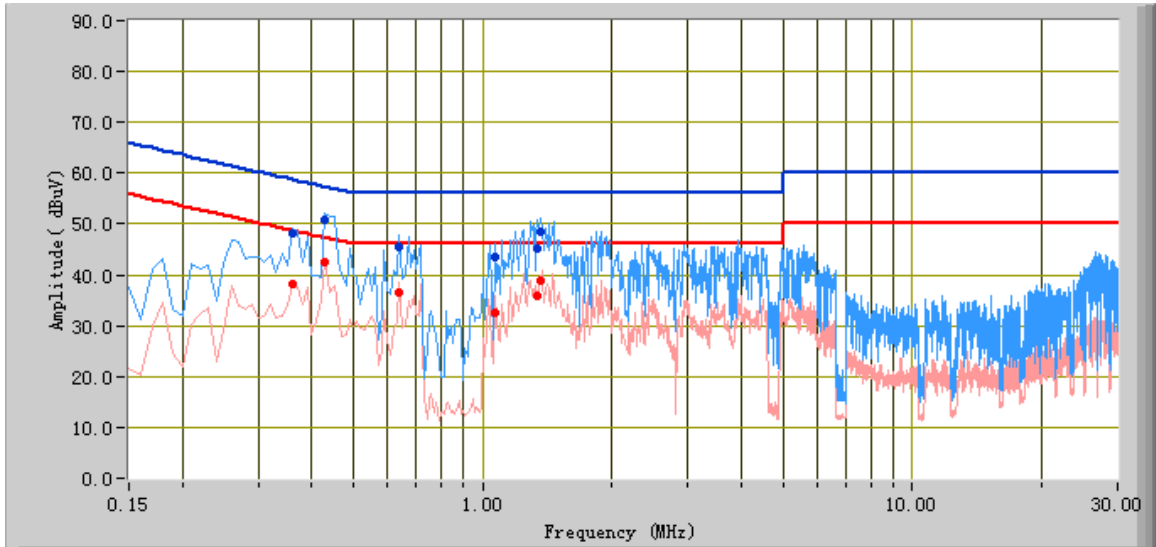
**Phase Line Plot at 120Vac, 60Hz**

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
1.37	47.12	56.00	-8.88	40.55	46.00	-5.45	10.32
0.85	49.07	56.00	-6.93	42.80	46.00	-3.20	10.37
1.32	47.60	56.00	-8.40	39.75	46.00	-6.25	10.32
0.38	48.29	58.28	-9.99	41.04	48.28	-7.24	11.08
0.90	47.46	56.00	-8.54	42.79	46.00	-3.21	10.35
0.44	46.04	57.06	-11.02	38.35	47.06	-8.71	10.81



<b>Test Mode:</b>	<b>Transmitting Mode</b>
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Peak Detector ▲ Quasi Peak Limit ▲  
 Average Detector ▲ Average Limit ▲



**Test Data**

**Phase Neutral Plot at 120Vac, 60Hz**

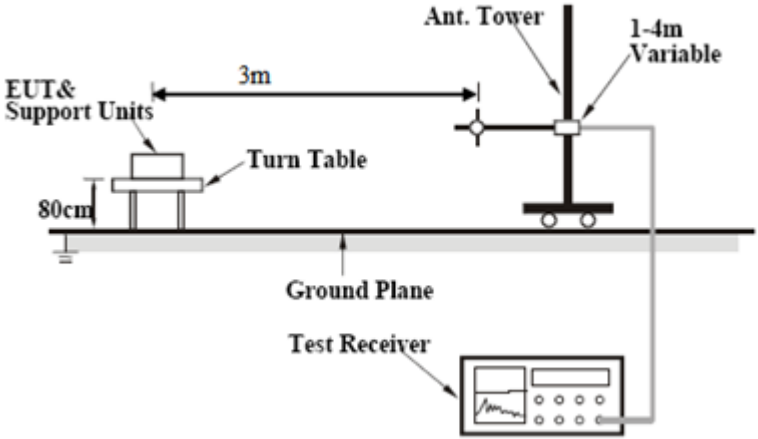
Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
1.36	48.62	56.00	-7.38	39.00	46.00	-7.00	10.32
1.34	45.30	56.00	-10.70	35.85	46.00	-10.15	10.32
0.43	50.94	57.25	-6.31	42.46	47.25	-4.79	10.86
0.64	45.61	56.00	-10.39	36.41	46.00	-9.59	10.48
0.36	48.03	58.73	-10.70	38.03	48.73	-10.70	11.17
1.07	43.66	56.00	-12.34	32.43	46.00	-13.57	10.28

## 6.7 Radiated Spurious Emissions

Temperature	19°C
Relative Humidity	60%
Atmospheric Pressure	1011mbar
Test date :	January 19, 2015
Tested By :	Winnie Zhang

### Requirement(s):

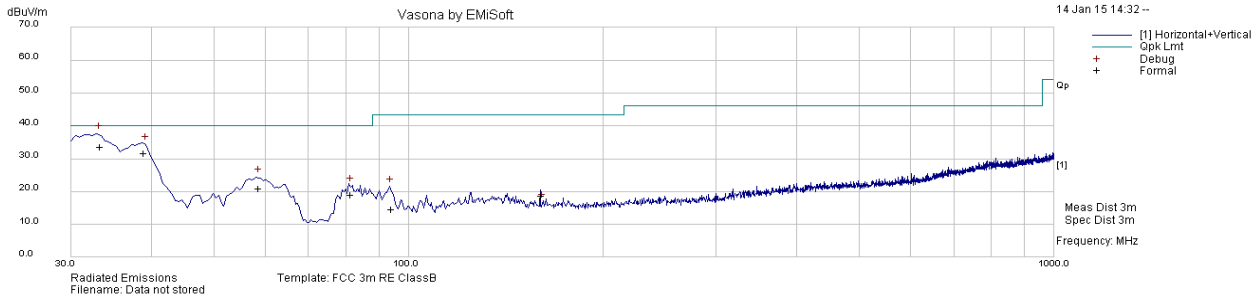
Spec	Item	Requirement	Applicable										
47CFR§15.247(d), RSS210 (A8.5)	a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (µV/m)</th> </tr> </thead> <tbody> <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> </tbody> </table>	Frequency range (MHz)	Field Strength (µV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	<input checked="" type="checkbox"/>
	Frequency range (MHz)	Field Strength (µV/m)											
	30 – 88	100											
88 – 216	150												
216 960	200												
Above 960	500												
b)	<p>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</p> <p><input checked="" type="checkbox"/> 20 dB down      <input type="checkbox"/> 30 dB down</p>	<input checked="" type="checkbox"/>											
c)	<p>or restricted band, emission must also comply with the radiated emission limits specified in 15.209</p>	<input checked="" type="checkbox"/>											

<p>Test Setup</p>	
<p>Procedure</p>	<ol style="list-style-type: none"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>2. 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"> <li>a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi Peak detection at frequency below 1GHz.</li> <li>4. 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.</li> <li>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>
<p>Remark</p>	<p>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.</p>
<p>Result</p>	<p><input checked="" type="checkbox"/> Pass      <input type="checkbox"/> Fail</p>

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

<b>Test Mode:</b>	<b>Transmitting Mode</b>
-------------------	--------------------------

**(Below 1GHz)**



Vasona Data : Formally Assessed Peaks

No	Frequen cy MHz	Raw dBµV	Cable Loss	AF dB	Level dBµV/ m	Measure ment Type	Pol	Hgt cm	Azt Deg	Limit dBµV/ m	Margin dB	Pass /Fail	Comme nts
1 (7)	33.3614	37.03	0.59	-3.98	33.64	Quasi Max	V	107	122	40	-6.36	Pass	
2 (8)	38.9234	38.54	0.65	-7.56	31.63	Quasi Max	V	100	85	40	-8.37	Pass	
3 (9)	58.675	34.87	0.78	-14.91	20.75	Quasi Max	V	118	291	40	-19.25	Pass	
4 (10)	81.5372	32.8	0.93	-14.82	18.91	Quasi Max	V	100	275	40	-21.09	Pass	
5 (11)	94.1804	27.53	1	-13.96	14.57	Quasi Max	V	228	52	43.5	-28.93	Pass	
6 (12)	161.065	26.81	1.31	-9.51	18.6	Quasi Max	H	292	27	43.5	-24.9	Pass	

<b>Test Mode:</b>	<b>Transmitting Mode</b>
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(Above 1GHz)

Note: Other modes were verified, only the result of worst case basic rate mode was presented.

Mode: 802.11b

**Low Channel (2412 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4824	34.27	AV	V	34	4.87	27.22	45.92	54	-8.08
4824	35.16	AV	H	33.8	4.87	27.22	46.61	54	-7.39
4824	43.67	PK	V	34	4.87	27.22	55.32	74	-18.68
4824	43.05	PK	H	33.8	4.87	27.22	54.5	74	-19.5

**Middle Channel (2437 MHz)**

Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4874	34.58	AV	V	33.6	4.87	26.52	46.53	54	-7.47
4874	34.49	AV	H	33.8	4.87	26.52	46.64	54	-7.36
4874	44.19	PK	V	33.6	4.87	26.52	56.14	74	-17.86
4874	43.85	PK	H	33.8	4.87	26.52	56	74	-18

**High Channel (2462 MHz)**

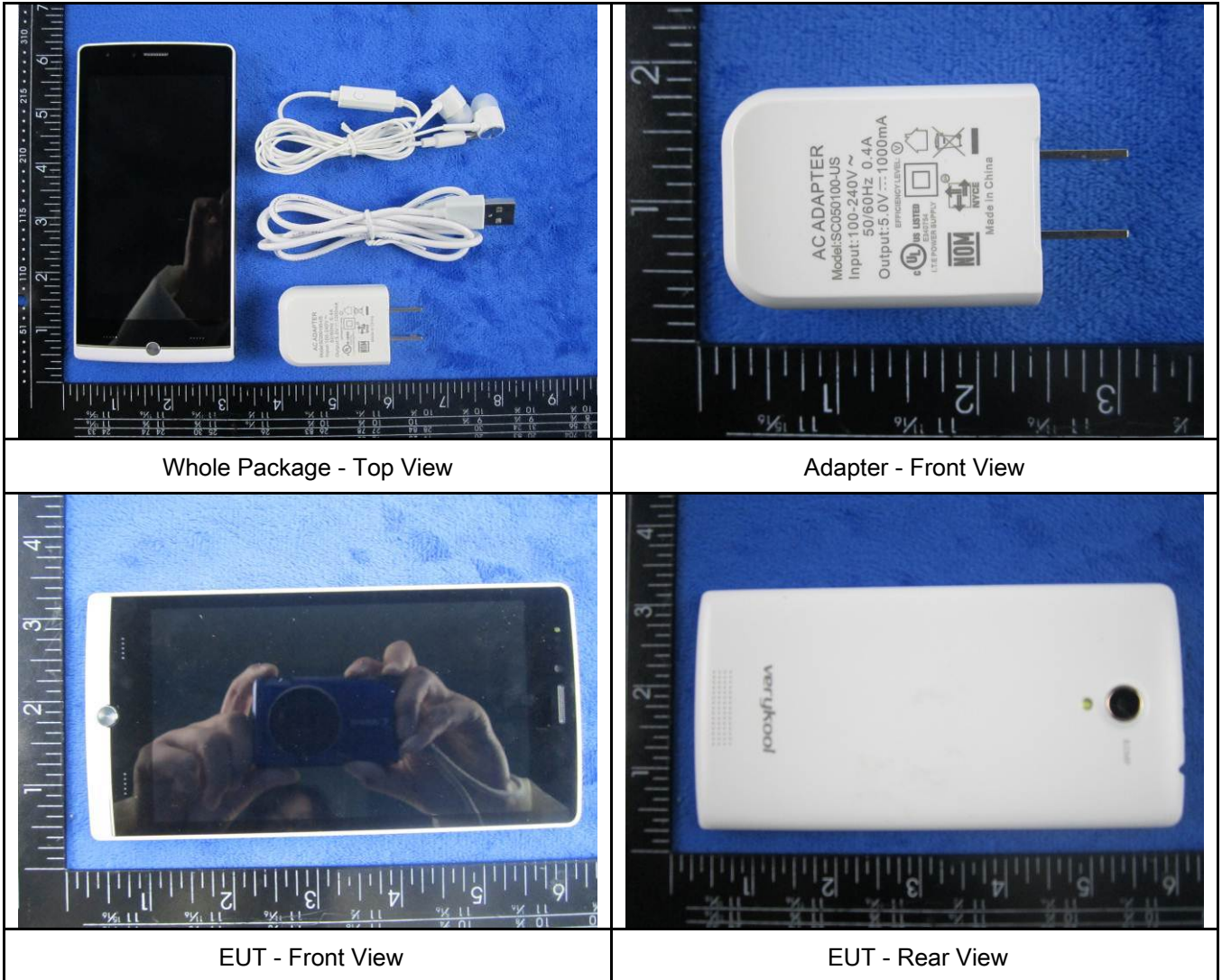
Frequency (MHz)	S.A. Reading (dB $\mu$ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4924	34.84	AV	V	34.6	4.87	26.42	47.89	54	-6.11
4924	33.16	AV	H	34.7	4.87	26.42	46.31	54	-7.69
4924	46.64	PK	V	34.6	4.87	26.42	59.69	74	-14.31
4924	44.16	PK	H	34.7	4.87	26.42	57.31	74	-16.69

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/18/2014	09/17/2015	<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	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/18/2014	09/17/2015	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/18/2014	09/17/2015	<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	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
Microwave Preamplifier (0.5 ~ 18GHz)	PAM-118	443008	09/02/2014	09/01/2015	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/22/2014	09/21/2015	<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

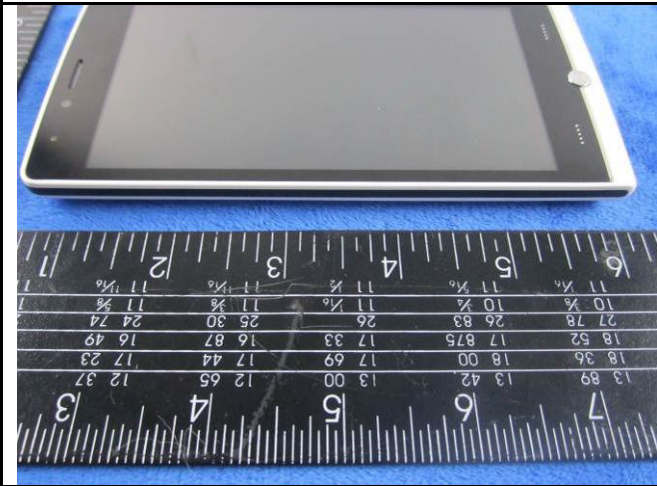




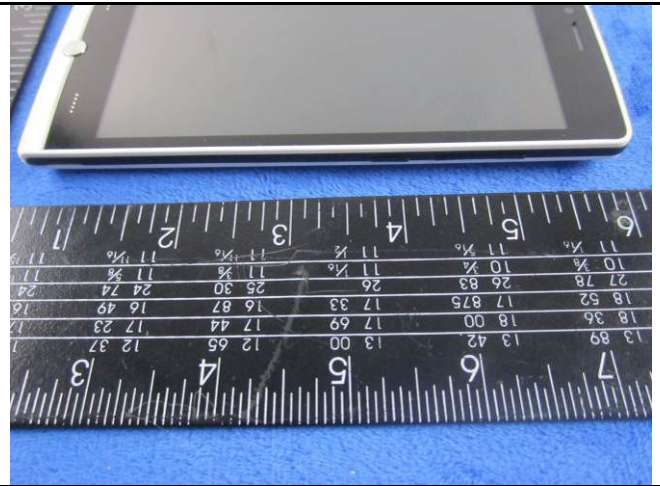
EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View



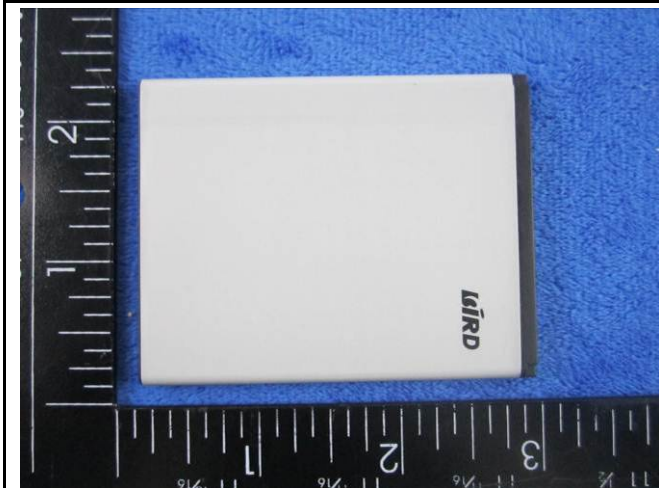
**Annex B.ii. Photograph: EUT Internal Photo**



Cover Off - Top View 1



Cover Off - Top View 2



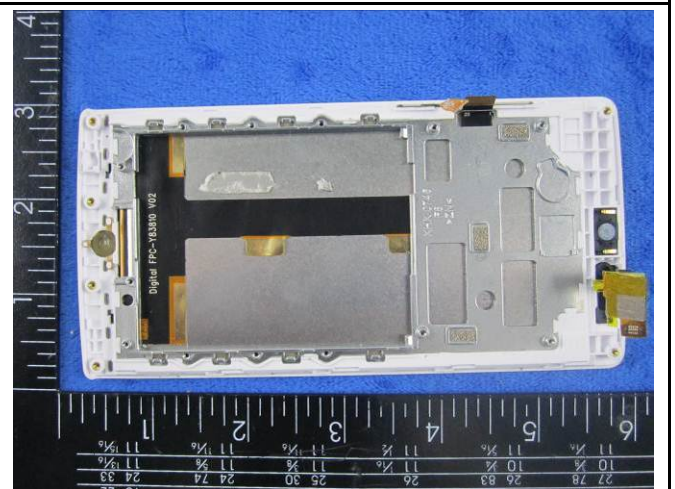
Battery - Top View



Battery - Bottom View



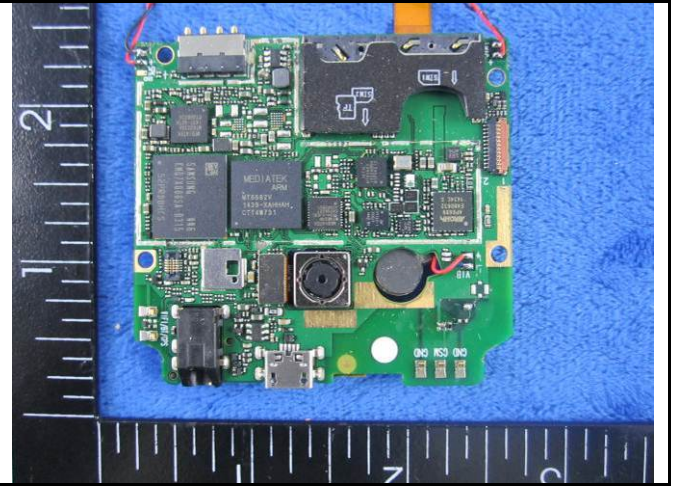
LCD - Front View



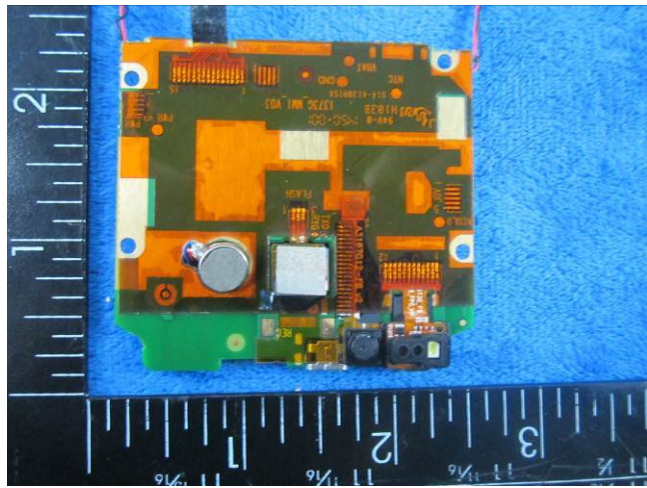
LCD - Rear View



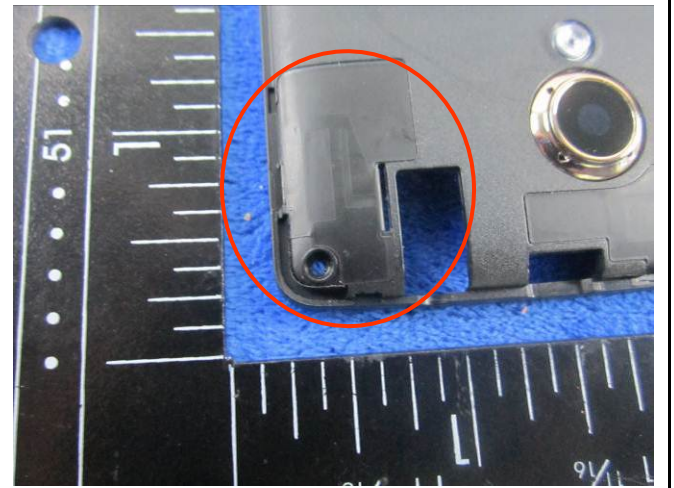
Mainborad With Shielding - Front View



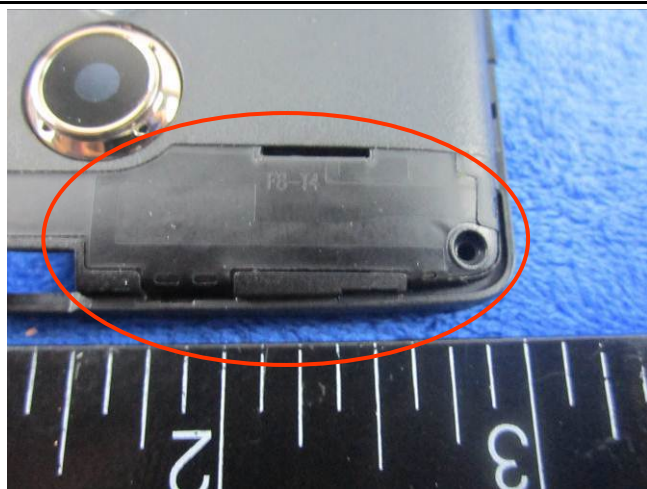
Mainborad Without Shielding - Front View



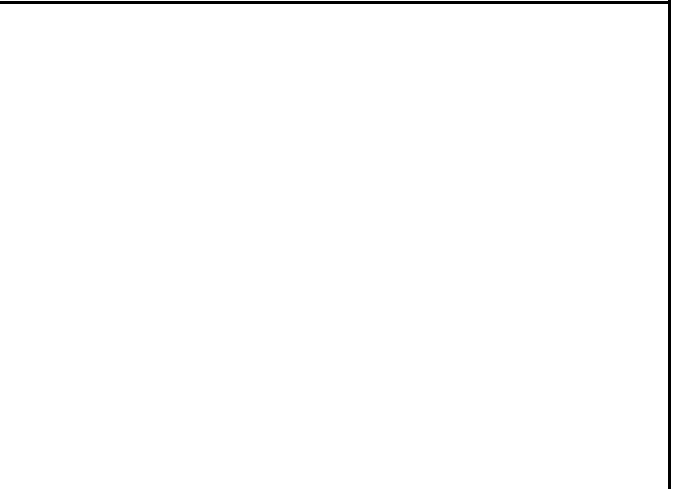
Mainborad - Rear View



BT/BLE/WIFI Antenna View



GSM/PCS/UMTS-FDD Antenna View



**Annex B.iii. Photograph: Test Setup Photo**



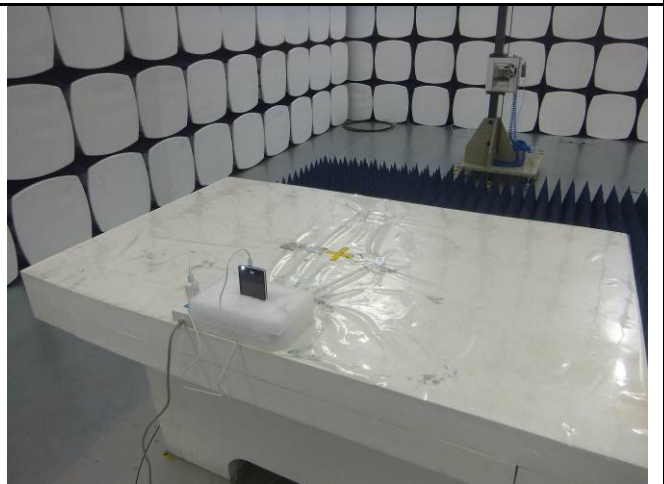
Conducted Emissions Test Setup Front View



Conducted Emissions Test Setup Side View



Radiated Spurious Emissions Test Setup Below 1GHz

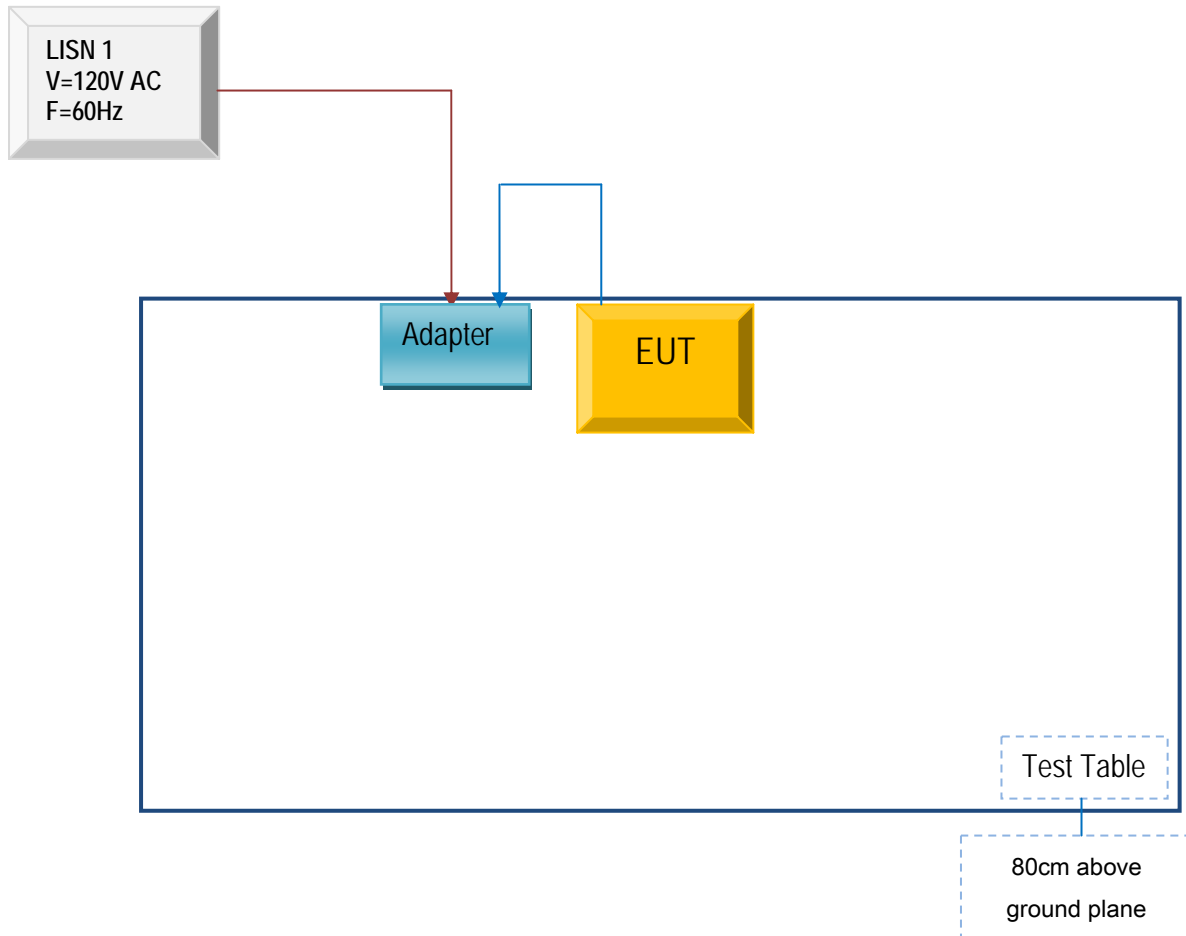


Radiated Spurious Emissions Test Setup Above 1GHz

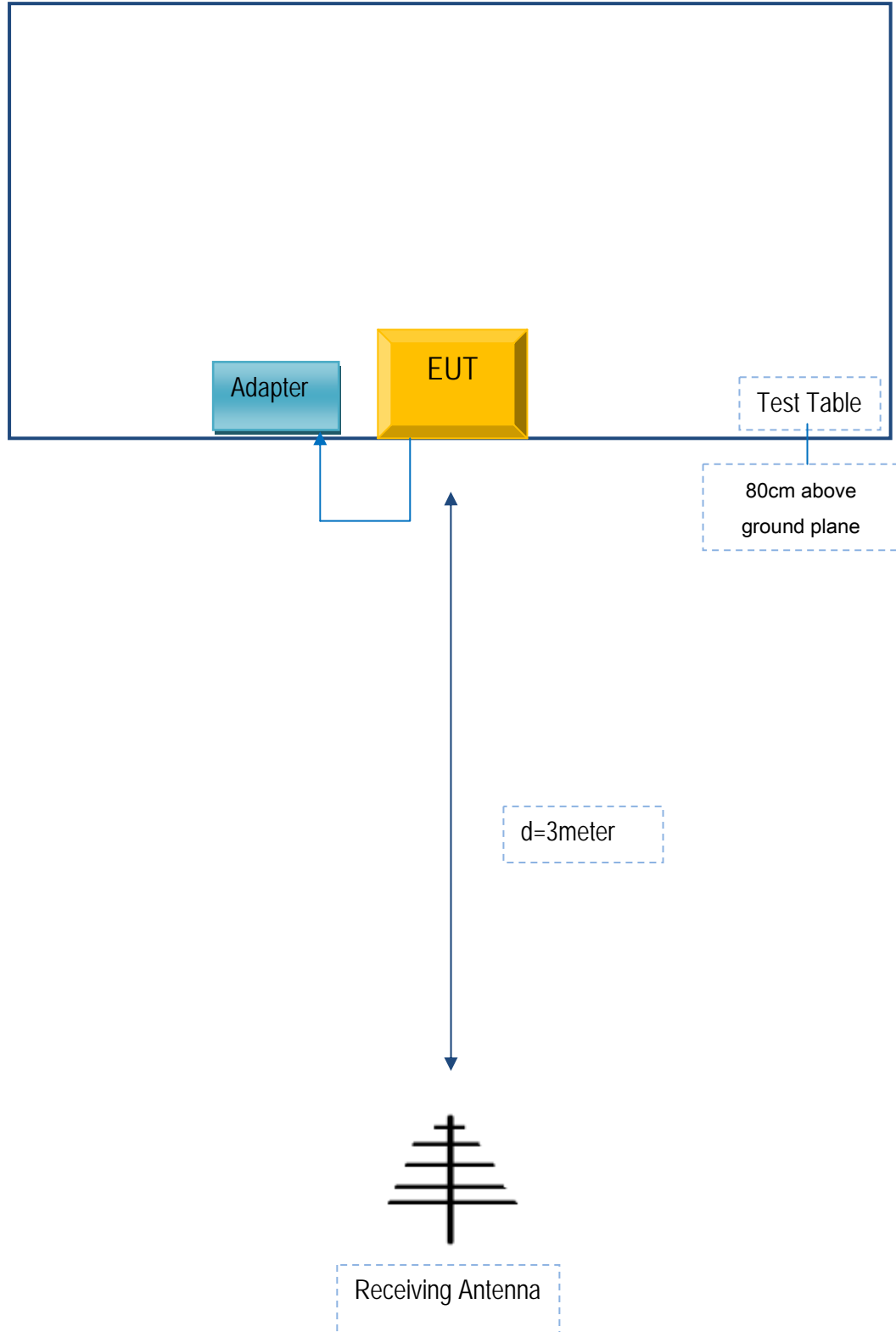
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

#### Block Configuration Diagram for AC Line Conducted Emissions



### Block Configuration Diagram for Radiated Emissions



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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.

<b>Manufacturer</b>	<b>Equipment Description</b>	<b>Model</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
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