

# RF TEST REPORT



Report No.: FCC\_IC\_RF\_SL15122401-BTF-003\_DTS\_WLAN\_Rev1.0

Supersede Report No.: None

Applicant	Butterfleye, Inc.
Product Name	Butterfleye Smart Camera
Model No.	WCAM100WH
Test Standard	47 CFR 15.247 RSS 247 Iss.1 : May 2015
Test Method	ANSI C63.10: 2013 RSS Gen Iss 4: Nov 2014 558074 D01 DTS Meas Guidance v03r04
FCC ID	2AG9N-BFLY1
IC ID	21091-BFLY1
Date of test	01/07/2016 – 01/14/2016
Issue Date	01/21/2016
Test Result	Pass Fail
Equipment complied with the specification	[ x ]
Equipment did not comply with the specification	[ ]
Rachana Khanduri	Chen Ge
Test Engineer	Engineer Reviewer
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:  
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### Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom,
Mexico	NOM, COFETEL, Caniety	EMC, RF/Wireless, Telecom, Safety
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

### Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

## CONTENTS

<b>1 REPORT REVISION HISTORY .....</b>	<b>4</b>
<b>2 EXECUTIVE SUMMARY.....</b>	<b>5</b>
<b>3 CUSTOMER INFORMATION .....</b>	<b>5</b>
<b>4 TEST SITE INFORMATION .....</b>	<b>5</b>
<b>5 MODIFICATION.....</b>	<b>5</b>
<b>6 EUT INFORMATION .....</b>	<b>6</b>
6.1 EUT Description .....	6
6.2 Radio Description .....	6
6.3 EUT Photos-External .....	7
6.4 EUT Photos (Internal) .....	8
6.5 EUT Test Setup Photos .....	9
<b>7 SUPPORTING EQUIPMENT/SOFTWARE AND CABLING DESCRIPTION.....</b>	<b>10</b>
7.1 Supporting Equipment .....	10
7.2 Cabling Description .....	10
7.3 Test Software Description .....	10
<b>8 TEST SUMMARY.....</b>	<b>11</b>
<b>9 MEASUREMENT UNCERTAINTY .....</b>	<b>12</b>
<b>10 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS.....</b>	<b>13</b>
10.1 Conducted Emissions.....	13
10.2 6dB Bandwidth .....	16
10.3 99% Occupied Bandwidth .....	20
10.4 Peak Output Power .....	24
10.5 Band Edge .....	26
10.6 Peak Spectral Density .....	28
10.7 Radiated Emissions below 1GHz.....	32
10.8 Radiated Spurious Emissions above 1GHz.....	34
<b>ANNEX A. TEST INSTRUMENT.....</b>	<b>39</b>
<b>ANNEX B. SIEMIC ACCREDITATION .....</b>	<b>40</b>

## 1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL15122401-BTF-003_DTS_WLAN	None	Original	01/21/2016
FCC_IC_RF_SL15122401-BTF-003_DTS_WLAN_Rev1.0	Rev1.0	Updated Antenna Gain	02/10/2016

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Butterfleye, Inc.  
Product: Butterfleye Smart Camera  
Model: WCAM100WH

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1<sup>st</sup> page.

## 3 Customer information

Applicant Name	Butterfleye Inc.
Applicant Address	2191-B, South El Camino Real, San Mateo, CA 94403, USA
Manufacturer Name	Appro Photoelectron, Inc.
Manufacturer Address	3F, No.23 Siyuan Rd., Xinzhuang Dist., New Taipei, 24251 Taiwan, (R.O.C)

## 4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

## 5 Modification

Index	Item	Description	Note
-	-	-	-

## 6 EUT Information

### 6.1 EUT Description

Product Name	:	Butterfleye Smart Camera
Model No.	:	WCAM100WH
Trade Name	:	Butterfleye
Serial No.	:	N/A
Host Model No.	:	N/A
Input Power	:	100-240V, 50/60Hz
Power Adapter Manu/Model	:	N/A
Power Adapter SN	:	N/A
Product Hardware version	:	DVT4
Product Software version	:	0.4.14
Radio Hardware version	:	DVT4
Radio Software version	:	0.4.14
Date of EUT received	:	01/07/2016
Equipment Class/ Category	:	DTS
Port/Connectors	:	USB

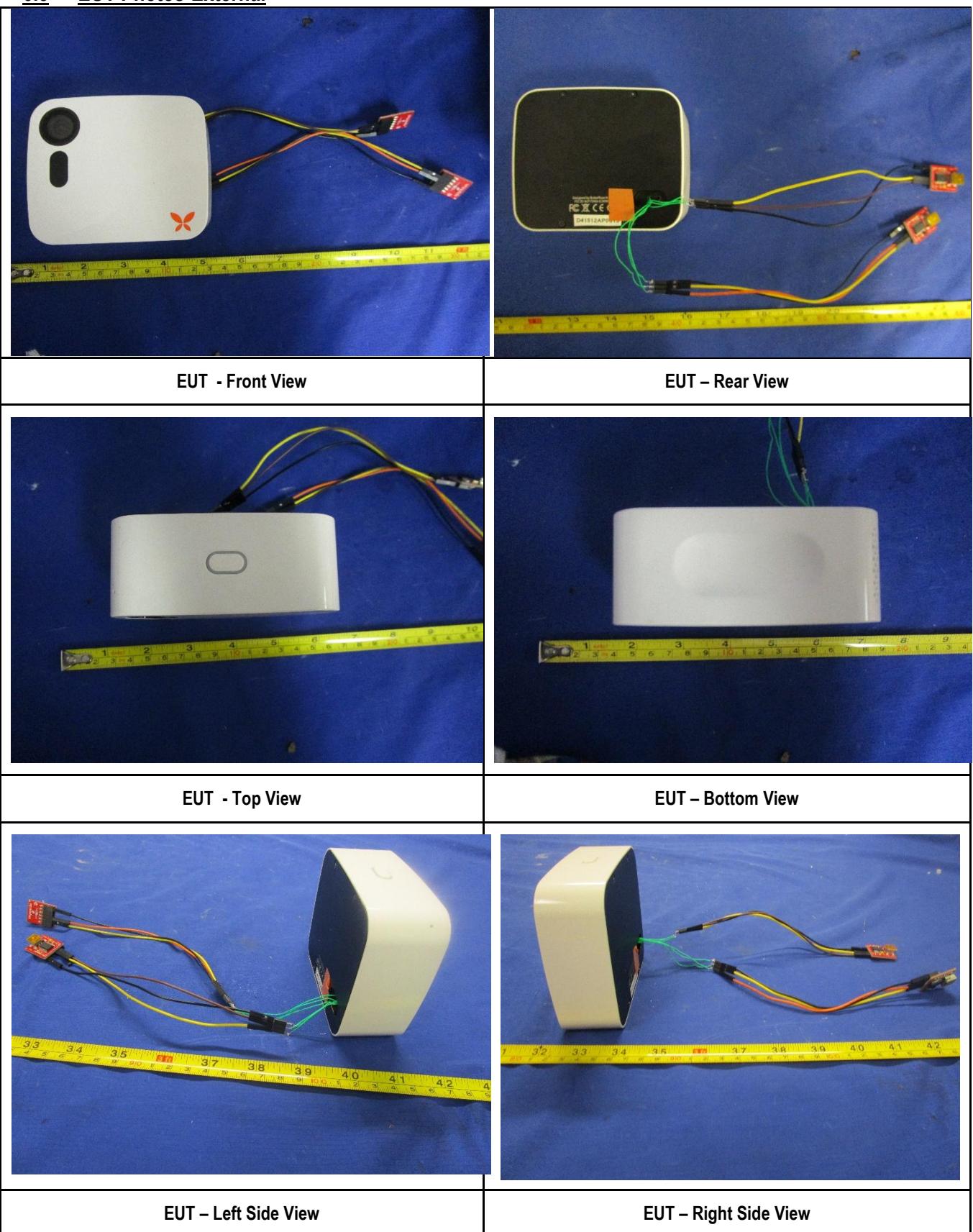
### 6.2 Radio Description

Radio Type	802.11b	802.11g	802.11n-20M
Operating Frequency	2412-2462MHz	2412-2462MHz	2412-2462MHz
Modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (BPSK, QPSK, 16QAM,64QAM)	OFDM (BPSK, QPSK, 16QAM, 64QAM)
Channel Spacing	5MHz	5MHz	5MHz(2.4GHz)
Number of Channels	11	11	11(2.4GHz)
Antenna Type		Dipole	
Antenna Gain (Peak)		3.8 dBi (Wifi)	
Antenna Connector Type		U.FL connector	

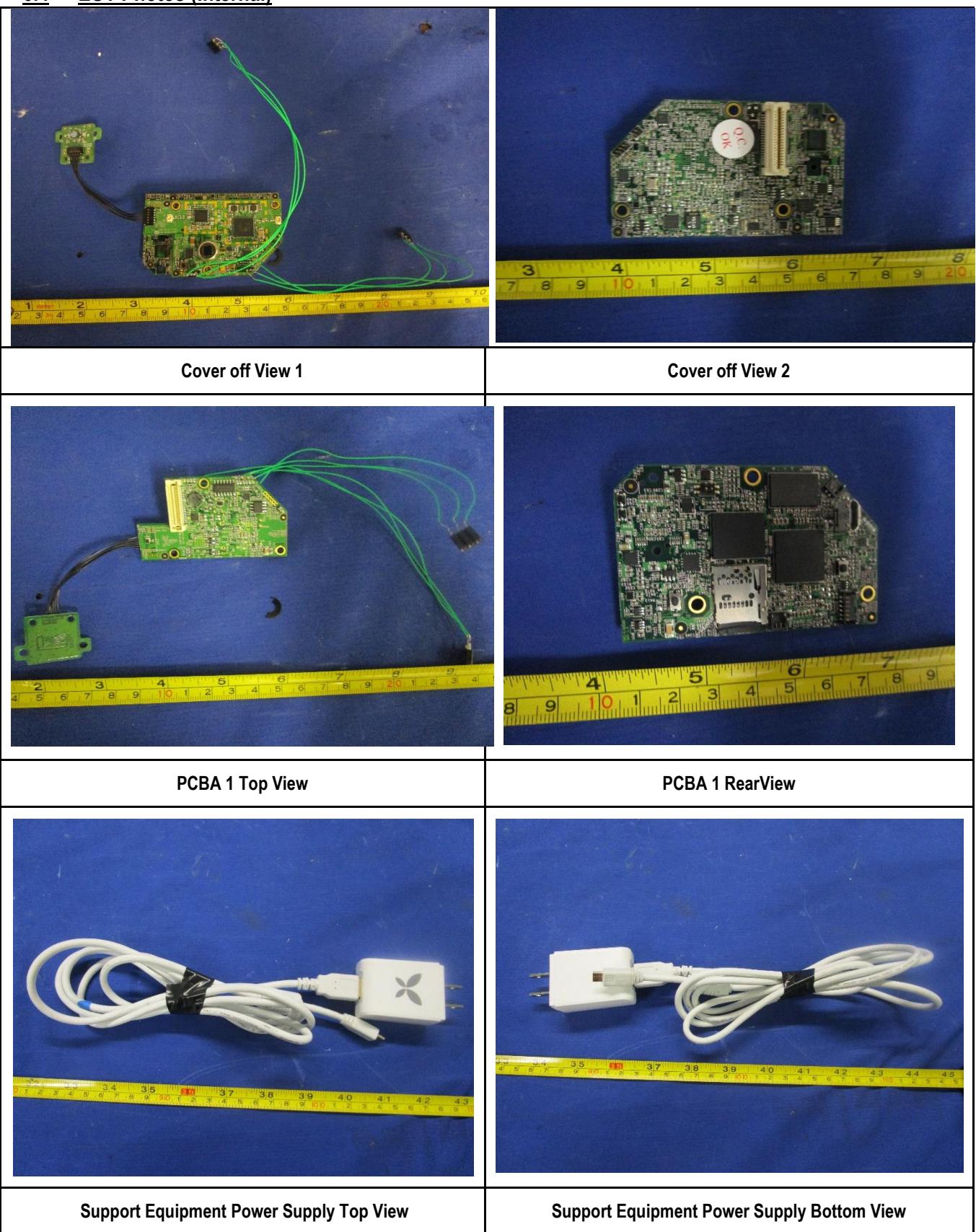
### EUT Power level setting

Mode	Frequency (MHz)	Power setting
802.11-b	2412	Default
802.11-b	2437	Default
802.11-b	2462	Default
802.11-g	2412	Default
802.11-g	2437	Default
802.11-g	2462	Default
802.11-n-20	2412	Default
802.11-n-20	2437	Default
802.11-n-20	2462	Default

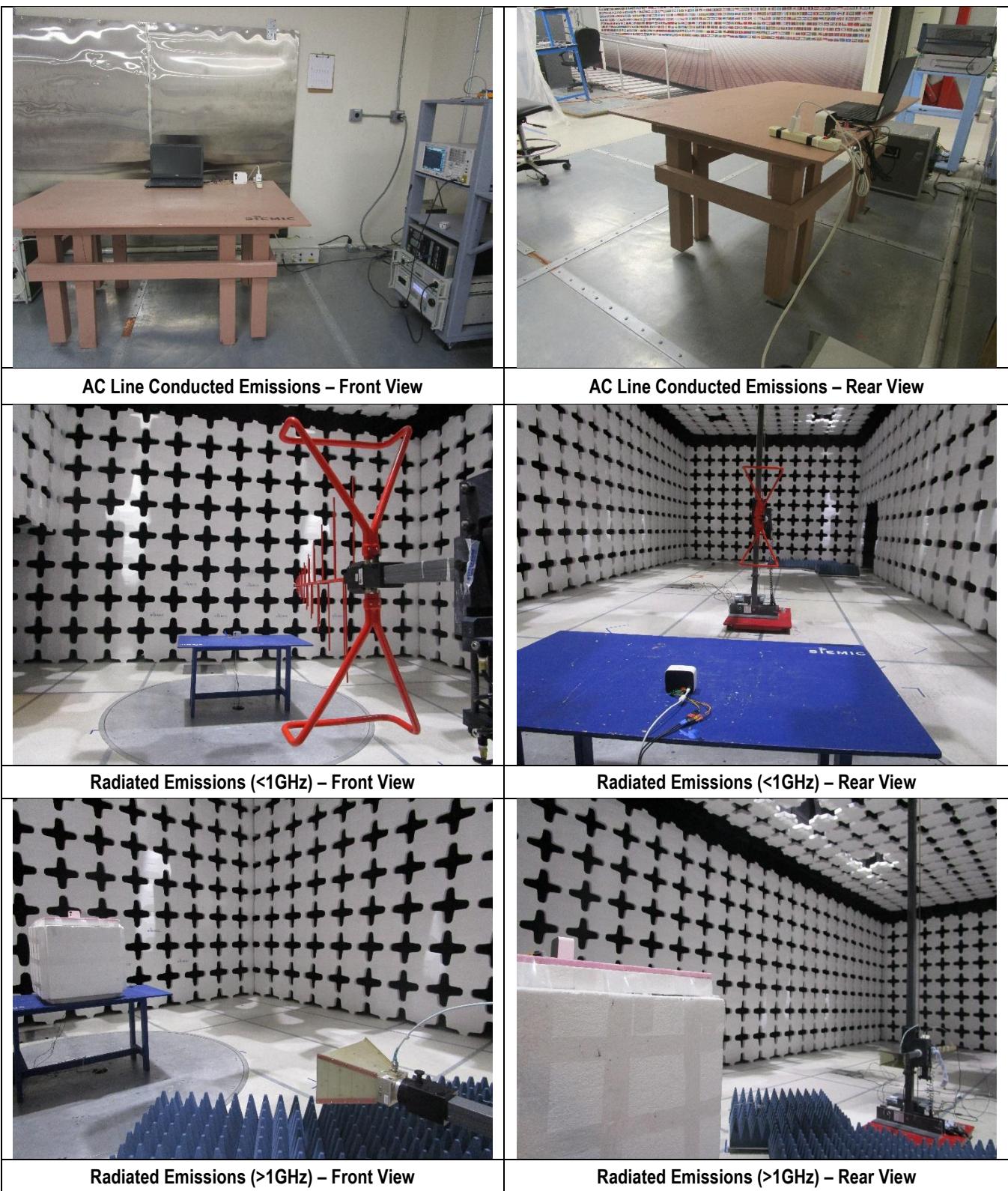
### 6.3 EUT Photos-External



#### 6.4 EUT Photos (Internal)



## 6.5 EUT Test Setup Photos



## 7 Supporting Equipment/Software and cabling Description

### 7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1.	Laptop	Latitude 3550	-	Dell	-

### 7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	I/O Port	Laptop	USB	2	Unshielded	-

### 7.3 Test Software Description

Test Item	Software	Description
RF Testing	RadioToolGUI.exe	Set the EUT to different modulation and channel

## 8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.10	IC		<input type="checkbox"/> N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013 RSS Gen Issue 4: 2014	<input type="checkbox"/> Pass
	IC	RSS Gen 8.8	IC		<input checked="" type="checkbox"/> N/A

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	<input type="checkbox"/> Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	<input checked="" type="checkbox"/> N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r04	<input type="checkbox"/> Pass
	IC	RSS247 (5.2.1)	IC		<input checked="" type="checkbox"/> N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.5)	IC		<input type="checkbox"/> N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r04	<input type="checkbox"/> Pass
	IC	RSS247 (5.4.4)	IC		<input checked="" type="checkbox"/> N/A
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	<input type="checkbox"/> Pass
	IC	-	IC	-	<input checked="" type="checkbox"/> N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r04	<input type="checkbox"/> Pass
	IC	RSS247 (5.2.2)	IC		<input checked="" type="checkbox"/> N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	<input type="checkbox"/> Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> N/A
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.				
Note	Only Radiated Spurious Emission was tested for AP1130 with sector antenna. Please refer to the report FR472301AA (Sponton Lab) for rest of the items.				

## 9 Measurement Uncertainty

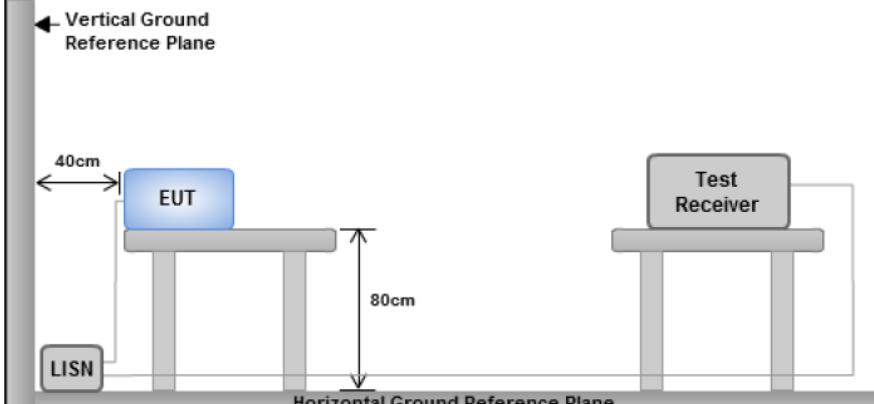
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	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)	+4.3dB/-4.1dB

## 10 Measurements, Examination and Derived Results

### 10.1 Conducted Emissions

#### Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

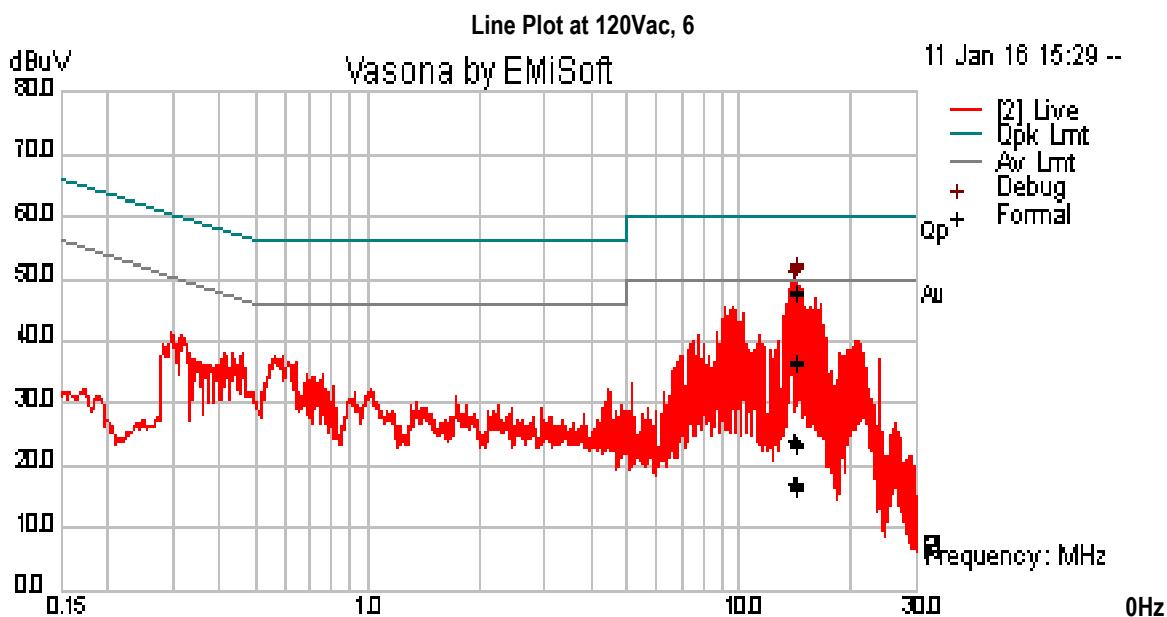
Spec	Item	Requirement	Applicable
§ 15.205 RSS Gen Issue 4: 2014 (8.8)	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the 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 frequency ranges.	<input checked="" type="checkbox"/>
Test Setup	 <p>Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes</p>		
Procedure	<ul 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, as shown in Annex B.</li> <li>- The power supply for the EUT was fed through a 50<math>\Omega</math>/50<math>\mu</math>H 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 coaxial cable.</li> <li>- All other supporting equipment was powered separately from another main supply.</li> </ul>		
Remark	EUT tested with AC 120V 60Hz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data     Yes       N/A

Test Plot     Yes (See below)       N/A

## Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result: <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Line			

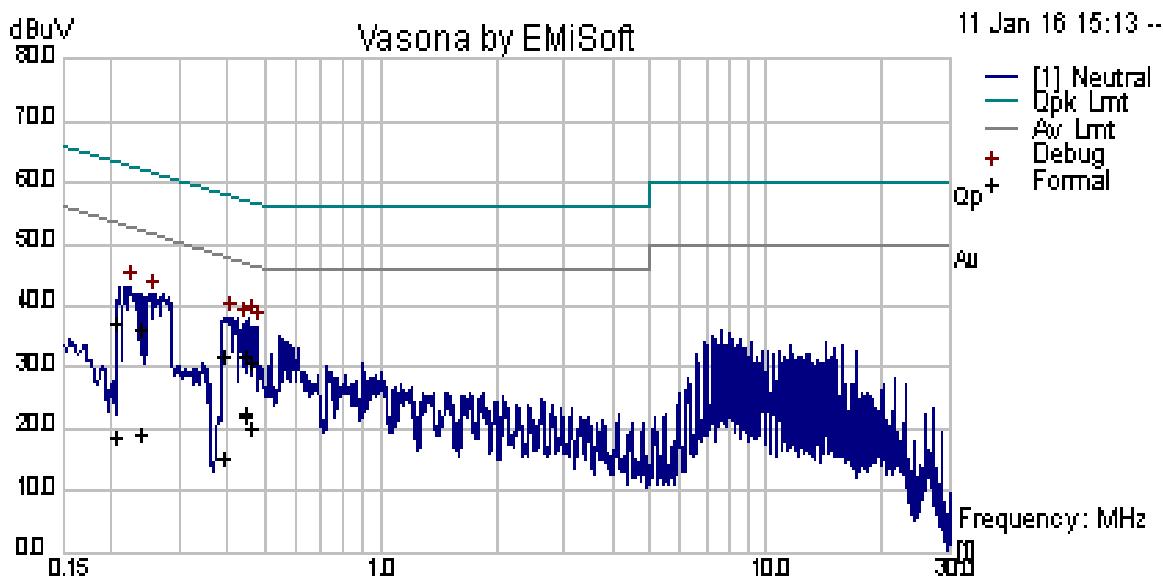


Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
14.15	36.97	10.06	0.59	47.62	Quasi Peak	Live	60	-12.38	Pass
14.31	37.62	10.06	0.59	48.27	Quasi Peak	Live	60	-11.73	Pass
14.35	37.28	10.06	0.59	47.93	Quasi Peak	Live	60	-12.07	Pass
14.20	12.49	10.06	0.59	23.14	Quasi Peak	Live	60	-36.86	Pass
14.24	12.85	10.06	0.59	23.50	Quasi Peak	Live	60	-36.50	Pass
14.12	13.16	10.06	0.59	23.81	Quasi Peak	Live	60	-36.19	Pass
14.15	25.80	10.06	0.59	36.45	Average	Live	50	-13.55	Pass
14.31	25.95	10.06	0.59	36.60	Average	Live	50	-13.40	Pass
14.35	6.45	10.06	0.59	17.10	Average	Live	50	-32.90	Pass
14.20	6.00	10.06	0.59	16.65	Average	Live	50	-33.35	Pass
14.24	5.48	10.06	0.59	16.13	Average	Live	50	-33.87	Pass
14.12	6.43	10.06	0.59	17.08	Average	Live	50	-32.92	Pass

Note: The results above show only the worst case.

## Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result: <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Neutral			



Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.448354	21.03	10.01	0.71	31.76	Quasi Peak	Neutral	56.91	-25.15	Pass
0.236899	25.30	10.00	1.12	36.43	Quasi Peak	Neutral	62.20	-25.78	Pass
0.205163	26.13	10.00	1.28	37.42	Quasi Peak	Neutral	63.40	-25.98	Pass
0.392989	20.98	10.01	0.76	31.74	Quasi Peak	Neutral	58.00	-26.26	Pass
0.463504	20.06	10.01	0.70	30.78	Quasi Peak	Neutral	56.63	-25.85	Pass
0.448763	21.05	10.01	0.71	31.77	Quasi Peak	Neutral	56.90	-25.13	Pass
0.448354	11.54	10.01	0.71	22.26	Average	Neutral	46.91	-24.65	Pass
0.236899	7.99	10.00	1.12	19.11	Average	Neutral	52.20	-33.09	Pass
0.205163	7.51	10.00	1.28	18.80	Average	Neutral	53.40	-34.60	Pass
0.392989	4.70	10.01	0.76	15.46	Average	Neutral	48.00	-32.54	Pass
0.463504	9.23	10.01	0.70	19.94	Average	Neutral	46.63	-26.69	Pass
0.448763	11.64	10.01	0.71	22.36	Average	Neutral	46.90	-24.54	Pass

Note: The results above show only the worst case.

## 10.2 6dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	a)(2)	6dB BW $\geq$ 500KHz;	<input checked="" type="checkbox"/>
Test Setup	 <p><b>Spectrum Analyzer</b> ————— EUT</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 8.1 DTS bandwidth</p> <p><u>6dB Emission bandwidth measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set RBW = 100 kHz.</li> <li>- Set the video bandwidth (VBW) <math>\geq 3 \times</math> RBW.</li> <li>- Detector = Peak.</li> <li>- Trace mode = max hold.</li> <li>- Sweep = auto couple.</li> <li>- Allow the trace to stabilize.</li> <li>- 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> </ul>		
Test Date	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

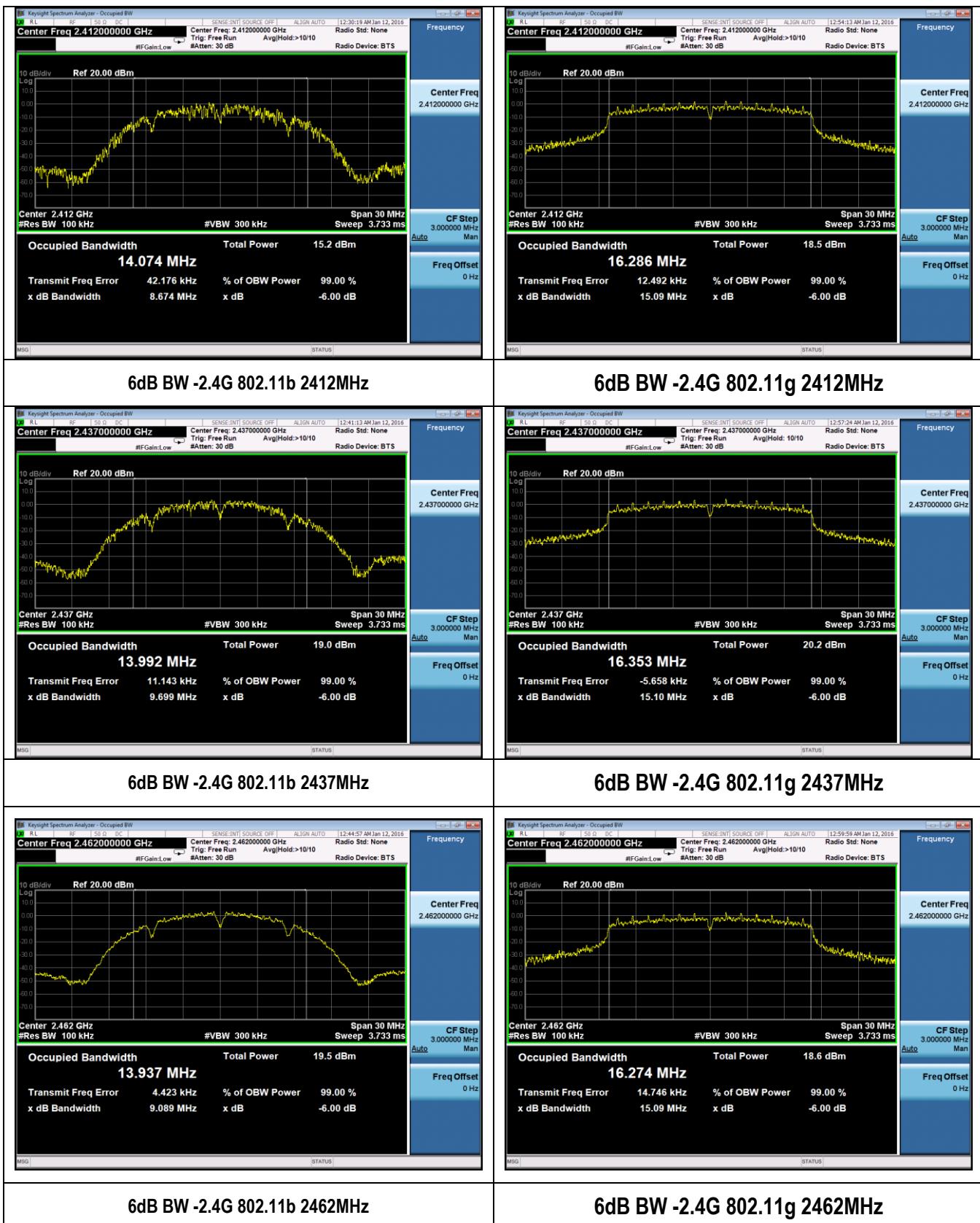
**Test Data**  Yes  N/A

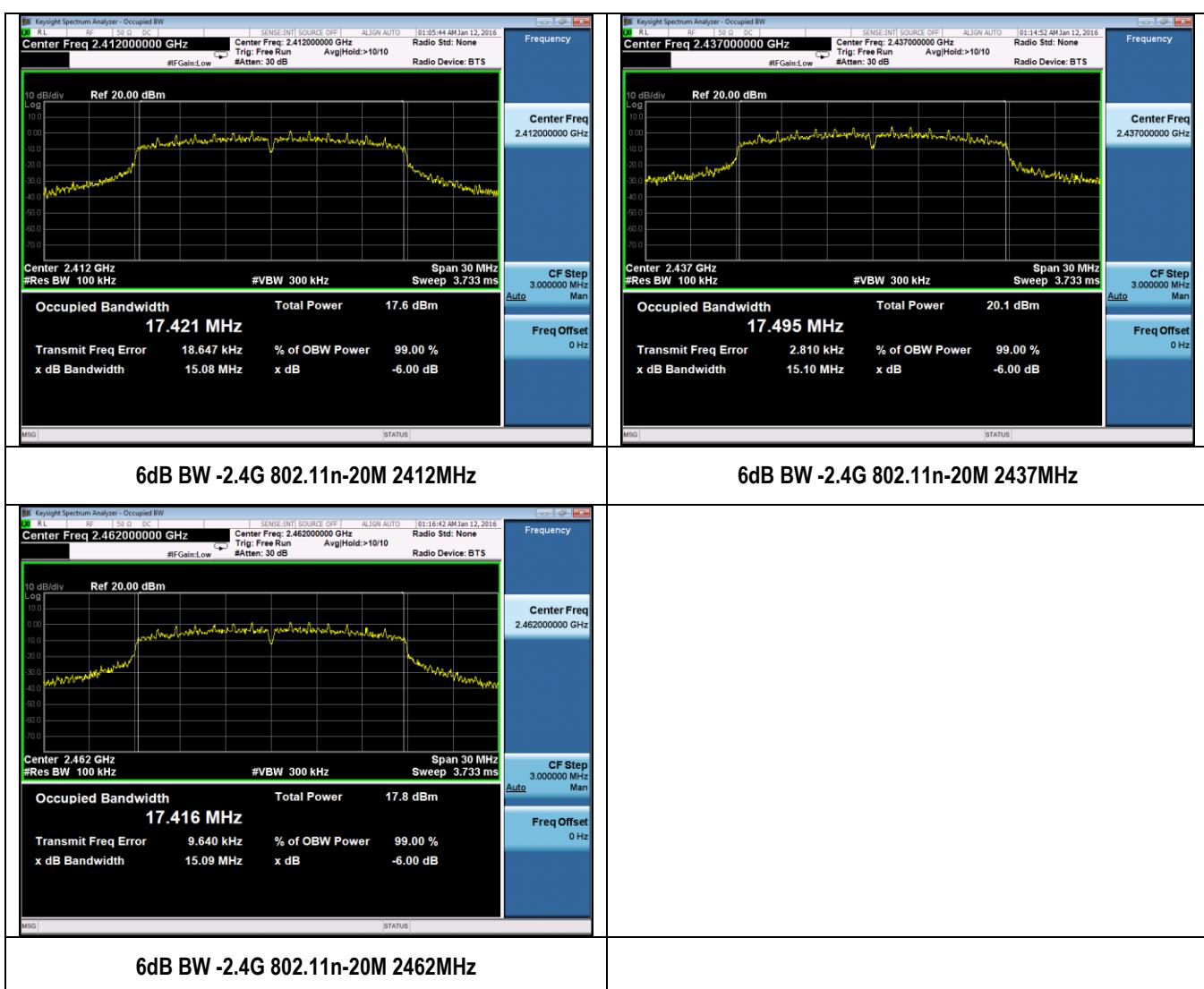
**Test Plot**  Yes  N/A

## 6dB Bandwidth measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	802.11b	2412	Low	8.67	≥0.5	Pass
6dB BW	802.11b	2437	Mid	9.69	≥0.5	Pass
6dB BW	802.11b	2462	High	9.09	≥0.5	Pass
6dB BW	802.11g	2412	Low	15.09	≥0.5	Pass
6dB BW	802.11g	2437	Mid	15.10	≥0.5	Pass
6dB BW	802.11g	2462	High	15.09	≥0.5	Pass
6dB BW	802.11n-20M	2412	Low	15.08	≥0.5	Pass
6dB BW	802.11n-20M	2437	Mid	15.10	≥0.5	Pass
6dB BW	802.11n-20M	2462	High	15.09	≥0.5	Pass

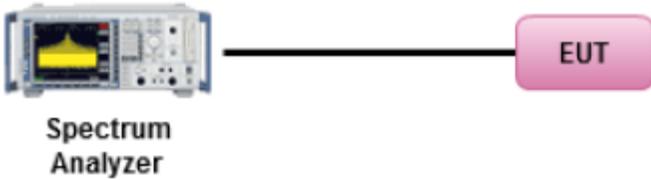
## Test Plots





### 10.3 99% Occupied Bandwidth

#### Requirements:

Spec	Requirement	Applicable
RSS Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth	<input checked="" type="checkbox"/>
Test Setup	 <p>Spectrum Analyzer</p> <p>EUT</p>	
Procedure	<ol style="list-style-type: none"> <li>1. EUT was set for low , mid, high channel with modulated mode and highest RF output power.</li> <li>2. The spectrum analyzer was connected to the antenna terminal.</li> </ol>	
Test Date	01/11/2016	Temperature 23oC Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	-	
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail

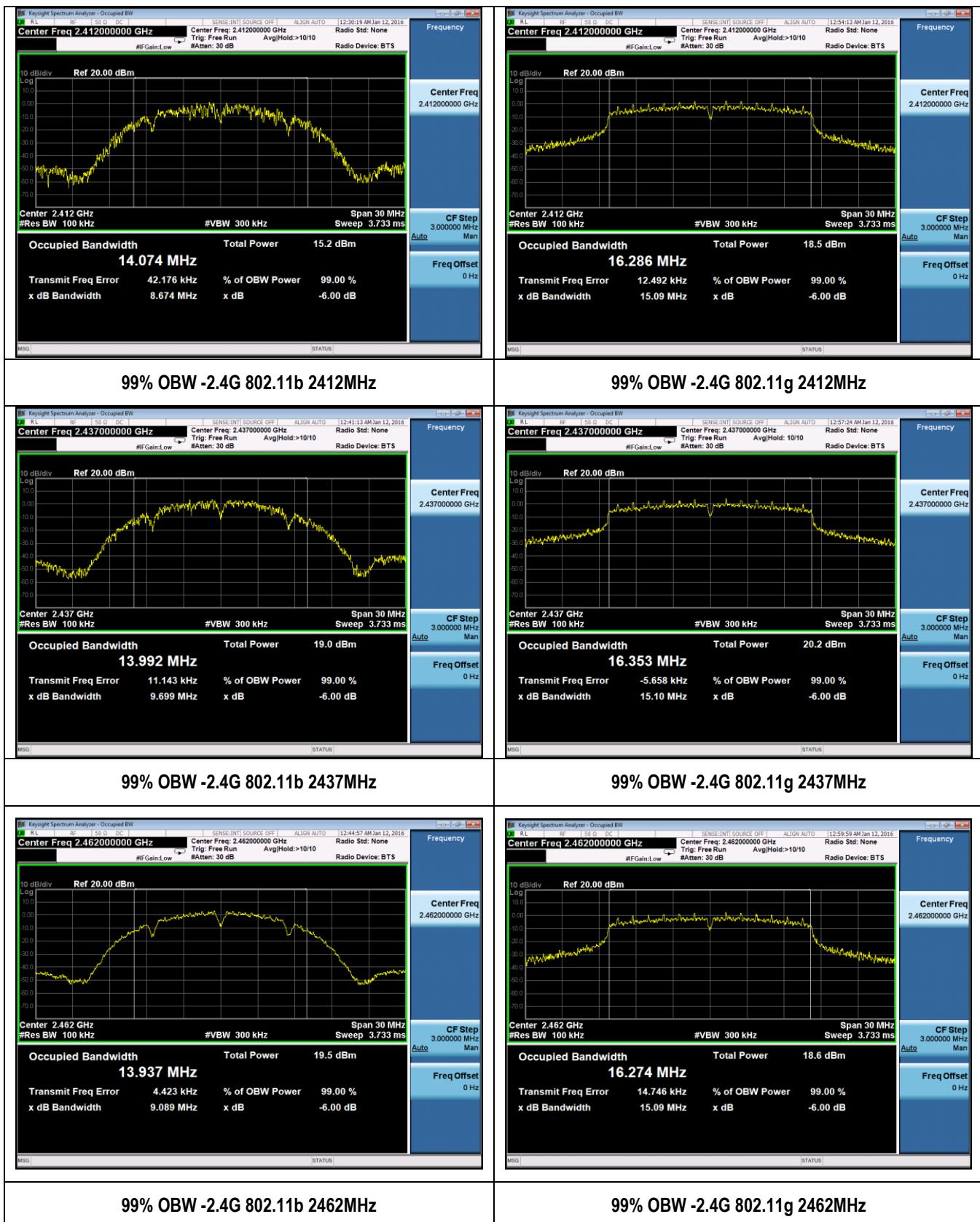
Test Data     Yes (See below)     N/A

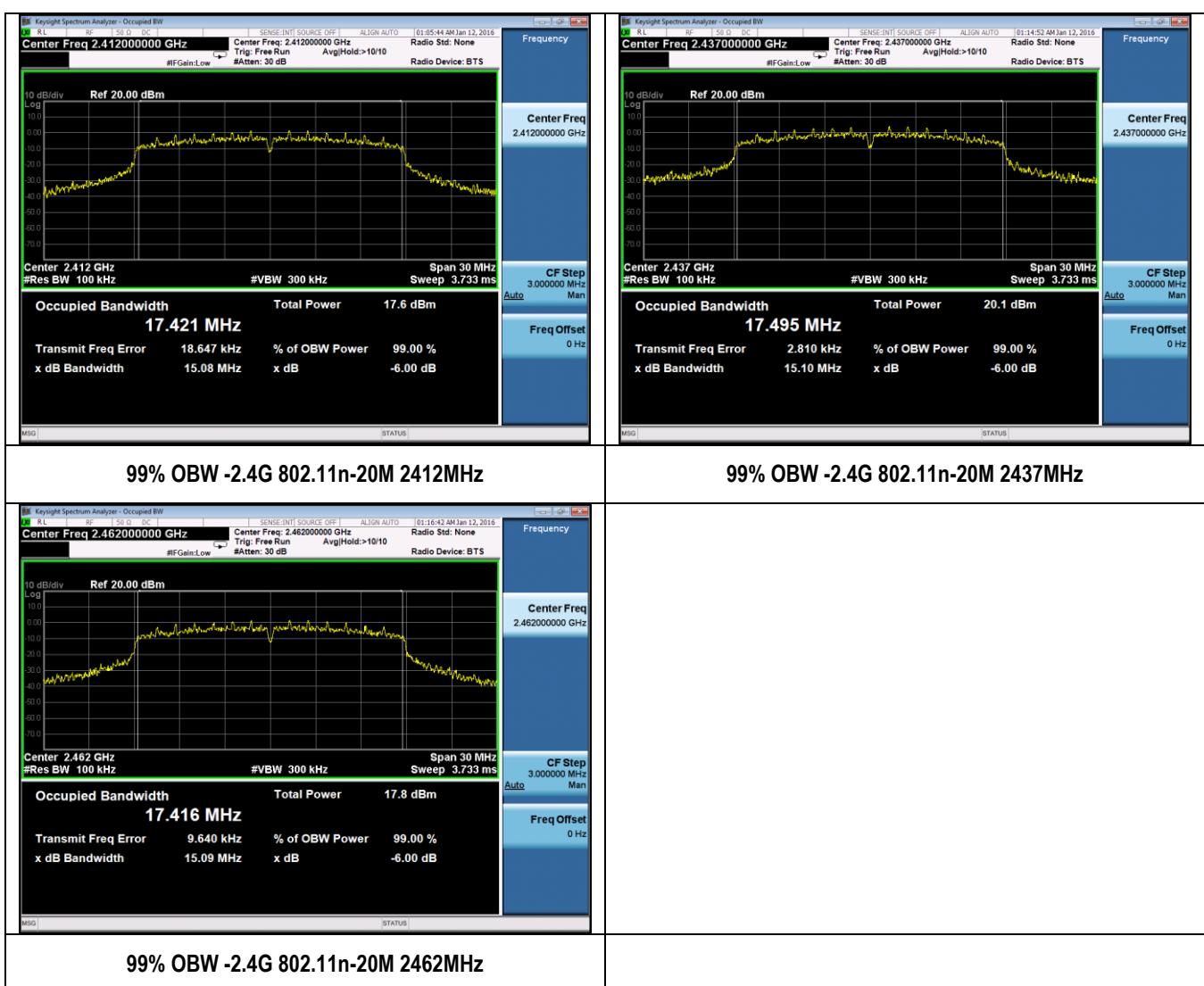
Test Plot     Yes (See below)     N/A

### 99% OBW measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	802.11b	2412	Low	14.074
99% OBW	802.11b	2437	Mid	13.992
99% OBW	802.11b	2462	High	13.937
99% OBW	802.11g	2412	Low	16.286
99% OBW	802.11g	2437	Mid	16.353
99% OBW	802.11g	2462	High	16.274
99% OBW	802.11n-20M	2412	Low	17.421
99% OBW	802.11n-20M	2437	Mid	17.495
99% OBW	802.11n-20M	2462	High	17.416

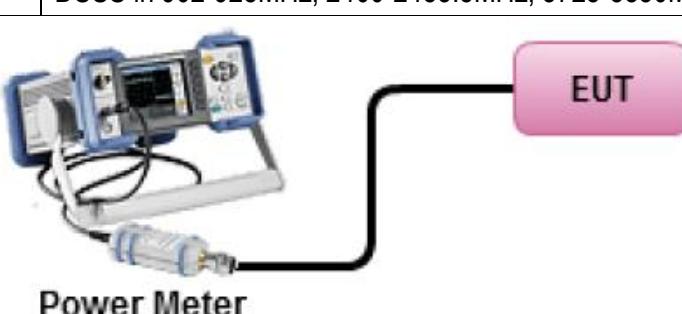
## Test Plots





## 10.4 Peak Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.4.4)	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>The diagram illustrates a test setup. A pink rounded rectangle labeled "EUT" represents the device under test. A black line extends from the EUT and connects to a blue rectangular meter labeled "Power Meter". The power meter has a digital display and several buttons or knobs. A power cord is shown connecting the power meter to an electrical outlet.</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 9.2.3.1</p> <p><u>Measurement using a Power Meter (PM)</u></p> <p>Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.</p> <ul style="list-style-type: none"> <li>- Connect EUT's RF output power to power meter</li> <li>- Set EUT to be continuous transmission mode</li> <li>- Measurement the average output power using power meter and record the result</li> <li>- Repeat above steps for different test channel and other modulation type.</li> </ul>		
Test Date	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	None		
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail	

Test Data  Yes  N/A

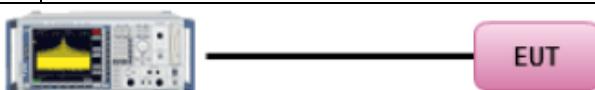
Test Plot  Yes (See below)  N/A

## Output Power measurement result

Type	Test mode	Freq (MHz)	CH	Output Power (dBm)	Limit (dBm)	Result
Output power	802.11b	2412	Low	11.75	30	Pass
Output power	802.11b	2437	Mid	13.79	30	Pass
Output power	802.11b	2462	High	12.20	30	Pass
Output power	802.11g	2412	Low	8.57	30	Pass
Output power	802.11g	2437	Mid	9.64	30	Pass
Output power	802.11g	2462	High	8.33	30	Pass
Output power	802.11n-20M	2412	Low	7.35	30	Pass
Output power	802.11n-20M	2437	Mid	9.70	30	Pass
Output power	802.11n-20M	2462	High	7.67	30	Pass

## 10.5 Band Edge

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247(5.5)	d)	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  <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down	<input checked="" type="checkbox"/>
Test Setup	 <p><b>Spectrum Analyzer</b> ————— EUT</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04</p> <p><u>Band Edge measurement procedure</u></p> <ol style="list-style-type: none"> <li>1. Set the EUT to maximum power setting and enable the EUT transmit continuously.</li> <li>2. Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. The attenuation shall be 30 dB instead of 20 dB when Peak conducted output power procedure is used.</li> <li>3. Change modulation and channel bandwidth then repeat step 1 to 2.</li> <li>4. Measured and record the results in the test report.</li> </ol>		
Test Date	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data     Yes                         N/A

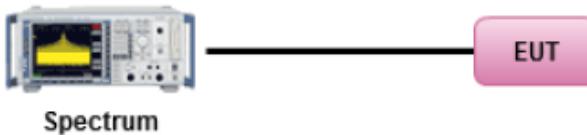
Test Plot     Yes (See below)                 N/A

## Test Plots



## 10.6 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e) RSS247 (5.2.2)	e) f)	DSSS: $\leq 8\text{dBm}/3\text{KHz}$ DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$	<input checked="" type="checkbox"/> <input type="checkbox"/>
Test Setup	 <p>Spectrum Analyzer</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 10.2 Method PKPSD (peak PSD)</p> <p><u>Peak spectral density measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set analyzer center frequency to DTS channel center frequency.</li> <li>- Set the span to 1.5 times the DTS bandwidth.</li> <li>- Set the RBW to: <math>3 \text{ kHz} \leqslant \text{RBW} \leqslant 100 \text{ kHz}</math>.</li> <li>- Set the VBW <math>\geqslant 3 \times \text{RBW}</math>.</li> <li>- Detector = Peak</li> <li>- Sweep time = auto couple.</li> <li>- Trace mode = Max Hold</li> <li>- Allow trace to fully stabilize.</li> <li>- Use the peak marker function to determine the maximum amplitude level within the RBW.</li> <li>- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.</li> </ul>		
Test Date	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

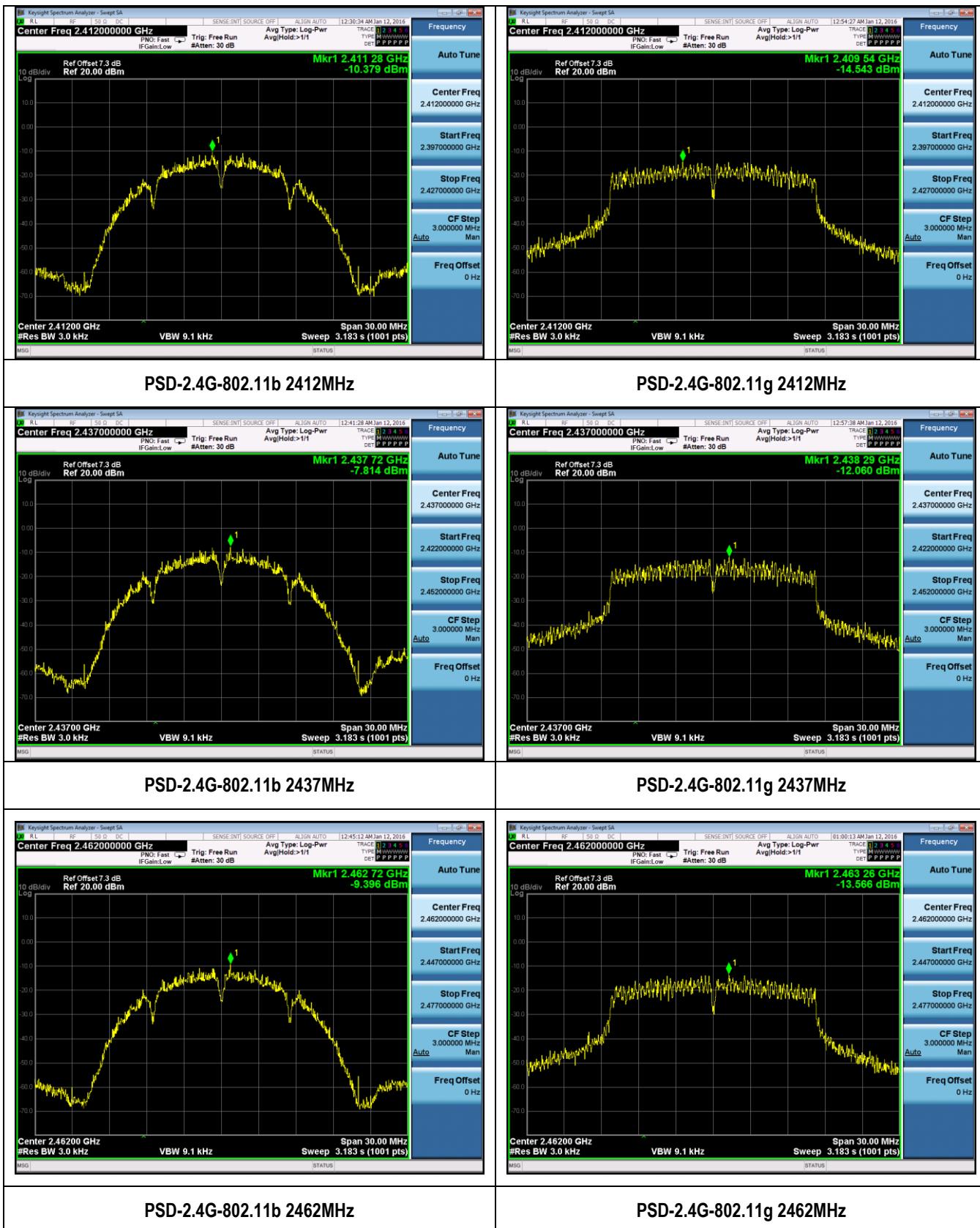
**Test Data**  Yes       N/A

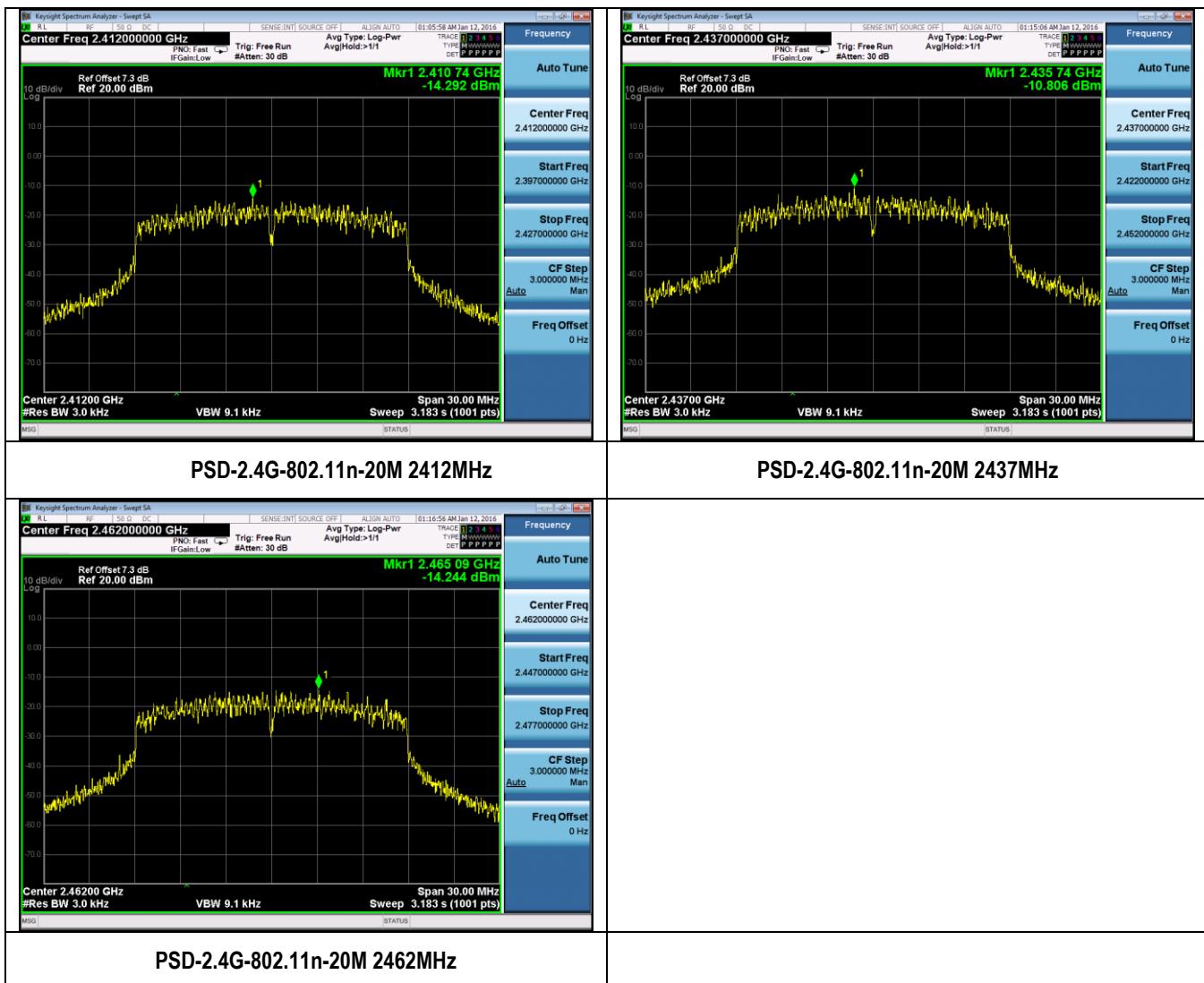
**Test Plot**  Yes (See below)       N/A

## PSD measurement result

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	802.11b	2412	Low	-10.379	≤8	Pass
PSD	802.11b	2437	Mid	-7.814	≤8	Pass
PSD	802.11b	2462	High	-9.396	≤8	Pass
PSD	802.11g	2412	Low	-14.543	≤8	Pass
PSD	802.11g	2437	Mid	-12.060	≤8	Pass
PSD	802.11g	2462	High	-13.566	≤8	Pass
PSD	802.11n-20M	2412	Low	-14.292	≤8	Pass
PSD	802.11n-20M	2437	Mid	-10.806	≤8	Pass
PSD	802.11n-20M	2462	High	-14.244	≤8	Pass

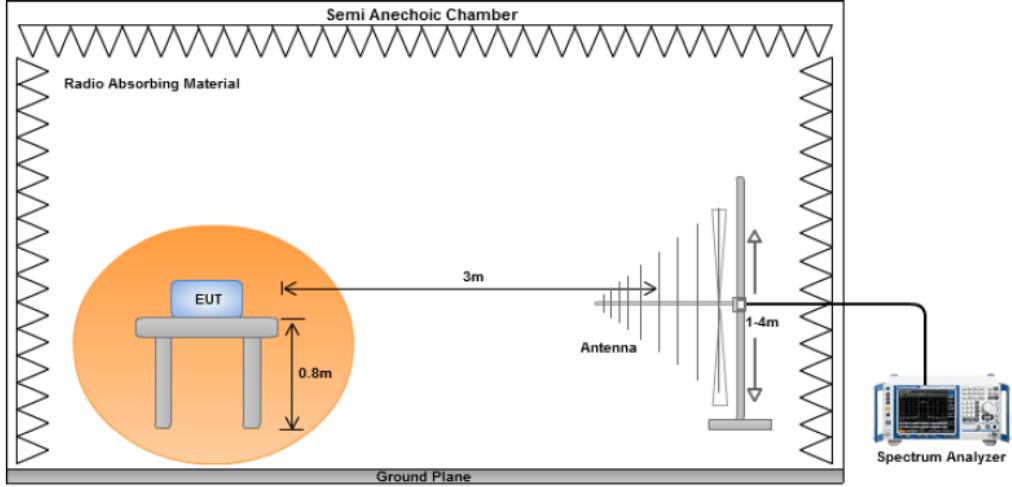
## Test Plots





## 10.7 Radiated Emissions below 1GHz

### Requirement(s):

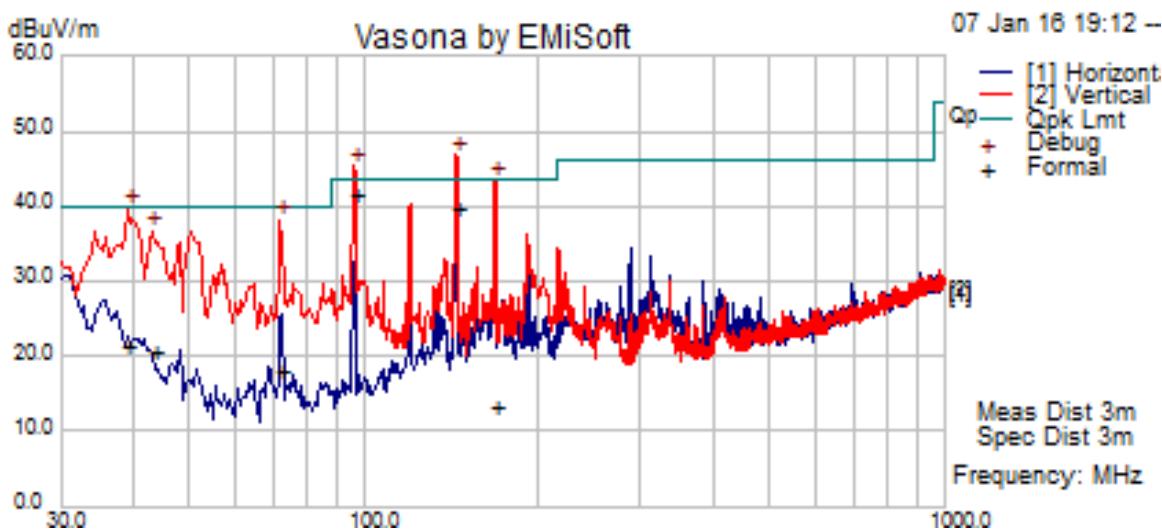
Spec	Item	Requirement	Applicable										
47CFR§15.247(d)	a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall 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 (uV/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 (uV/m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (uV/m)												
30 – 88	100												
88 – 216	150												
216 – 960	200												
Above 960	500												
Test Setup													
Procedure	<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 characterisation. 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 polarisation (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. A Quasi-peak measurement was then made for that frequency point.</li> <li>4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>												
Remark	The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.												
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail												

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

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

## Radiated Emission Test Results (Below 1GHz)

Test specification		Below 1GHz	
Environmental Conditions:	Temp (°C):	25.7	
	Humidity (%)	29	
	Atmospheric (mPa):		
Mains Power:	110VAC, 60Hz		Result
Tested by:	Rachana Khanduri		
Test Date:	01/07/2016		
Remarks:	2.4GHz 11n20 2437MHz		



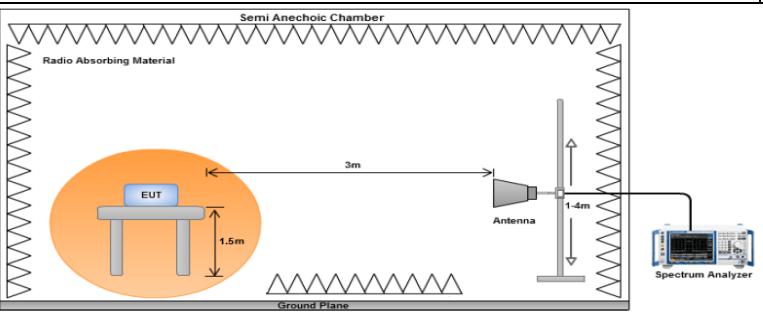
### Quasi Max Measurement

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
143.96	63.13	1.96	-25.53	39.56	Quasi Max	V	121	181	43.52	-3.96	Pass
96.151	69.12	1.59	-29.31	41.4	Quasi Max	V	135	129	43.52	-2.12	Pass
168.27	38.09	2.15	-27.04	13.2	Quasi Max	V	224	39	43.52	-30.32	Pass
39.03	42.41	0.9	-21.9	21.41	Quasi Max	V	114	125	40	-18.59	Pass
71.874	46.9	1.37	-30.16	18.11	Quasi Max	V	159	204	40	-21.89	Pass
43.336	44.64	1.02	-24.94	20.72	Quasi Max	V	138	185	40	-19.28	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

## 10.8 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d) RSS247 (5.5)	a)	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 <input checked="" type="checkbox"/> 20 dB down <input type="checkbox"/> 30 dB down	<input checked="" type="checkbox"/>
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>
Test Setup			
Procedure	<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 characterisation. 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 polarisation (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. An average measurement was then made for that frequency point.</li> <li>4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>		
Test Date	01/14/2016	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	<p>The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. For spurious emission measurement, if the peak emission is below 54 dBuV/m average limit, the average value is not be measured.</p> <p>Both horizontal and vertical polarization have been verified.</p>		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

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

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

## Radiated Spurious Emission Test Results (Above 1GHz)

### Above 1GHz – 802.11b – 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
2093.95	40.25	4.36	11.18	55.79	Peak Max	V	146	38	74	-18.21	Pass
6058.78	36.53	10.55	10.92	58.01	Peak Max	H	203	243	74	-15.99	Pass
10754.34	36.14	12.19	8.38	56.71	Peak Max	H	163	75	74	-17.29	Pass
2093.95	28.57	4.36	11.18	44.12	Average Max	V	146	38	54	-9.88	Pass
6058.78	24.44	10.55	10.92	45.92	Average Max	H	203	243	54	-8.08	Pass
10754.34	23.98	12.19	8.38	44.55	Average Max	H	163	75	54	-9.45	Pass

### Above 1GHz – 802.11b – 2437MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
17650.18	34.95	16.53	10.55	62.04	Peak Max	V	187	346	74	-11.97	Pass
6088.10	36.07	10.59	10.85	57.52	Peak Max	V	217	125	74	-16.48	Pass
2115.05	39.92	4.38	11.11	55.41	Peak Max	V	202	205	74	-18.59	Pass
17650.18	22.76	16.53	10.55	49.84	Average Max	V	187	346	54	-4.16	Pass
6088.10	24.57	10.59	10.85	46.02	Average Max	V	217	125	54	-7.98	Pass
2115.05	28.34	4.38	11.11	43.84	Average Max	V	202	205	54	-10.16	Pass

### Above 1GHz – 802.11b – 2462MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
17371.91	33.96	16.77	10.01	60.75	Peak Max	H	178	119	74	-13.25	Pass
5994.91	35.64	10.46	11.06	57.17	Peak Max	H	190	215	74	-16.84	Pass
2032.52	40.27	4.31	11.37	55.96	Peak Max	H	242	124	74	-18.04	Pass
17371.91	22.83	16.77	10.01	49.62	Average Max	H	178	119	54	-4.38	Pass
5994.91	24.30	10.46	11.06	45.82	Average Max	H	190	215	54	-8.18	Pass
2032.52	28.37	4.31	11.37	44.05	Average Max	H	242	124	54	-9.95	Pass

### Above 1GHz – 802.11g – 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
17414.07	34.32	16.78	10.14	61.24	Peak Max	H	221	39	74	-12.76	Pass
6027.58	35.88	10.51	11.00	57.40	Peak Max	H	118	354	74	-16.6	Pass
4208.41	37.50	9.02	11.32	57.85	Peak Max	V	136	277	74	-16.16	Pass
17414.07	22.75	16.78	10.14	49.67	Average Max	H	221	39	54	-4.33	Pass
6027.58	24.34	10.51	11.00	45.86	Average Max	H	118	354	54	-8.14	Pass
4208.41	25.46	9.02	11.32	45.80	Average Max	V	136	277	54	-8.20	Pass

### Above 1GHz – 802.11g – 2437MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4187.89	36.82	8.97	11.41	57.20	Peak Max	H	132	110	74	-16.80	Pass
17466.97	34.49	16.79	10.3	61.58	Peak Max	V	126	296	74	-12.42	Pass
6013.99	36.36	10.50	11.03	57.89	Peak Max	V	226	143	74	-16.11	Pass
4187.89	25.58	8.97	11.41	45.96	Average Max	H	132	110	54	-8.04	Pass
17466.97	22.85	16.79	10.30	49.94	Average Max	V	126	296	54	-4.06	Pass
6013.99	24.46	10.50	11.03	45.99	Average Max	V	226	143	54	-8.01	Pass

### Above 1GHz – 802.11g – 2462MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4122.56	36.73	8.81	11.69	57.23	Peak Max	V	194	162	74	-16.77	Pass
6098.76	36.60	10.6	10.83	58.04	Peak Max	V	217	182	74	-15.96	Pass
17799.88	34.72	16.27	10.71	61.69	Peak Max	H	220	9	74	-12.31	Pass
4122.56	25.50	8.81	11.69	46	Average Max	V	194	162	54	-8.00	Pass
6098.76	24.39	10.6	10.83	45.82	Average Max	V	217	182	54	-8.18	Pass
17799.88	22.88	16.27	10.71	49.85	Average Max	H	220	9	54	-4.15	Pass

### Above 1GHz – 802.11n20 – 2412MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
17701.18	34.75	16.44	10.60	61.79	Peak Max	H	134	73	74	-12.21	Pass
4154.31	37.16	8.89	11.55	57.60	Peak Max	V	217	147	74	-16.40	Pass
6152.18	36.19	10.67	10.70	57.56	Peak Max	H	232	223	74	-16.44	Pass
17701.18	22.88	16.44	10.60	49.93	Average Max	H	134	73	54	-4.07	Pass
4154.31	25.67	8.89	11.55	46.12	Average Max	V	217	147	54	-7.88	Pass
6152.18	24.54	10.67	10.70	45.91	Average Max	H	232	223	54	-8.09	Pass

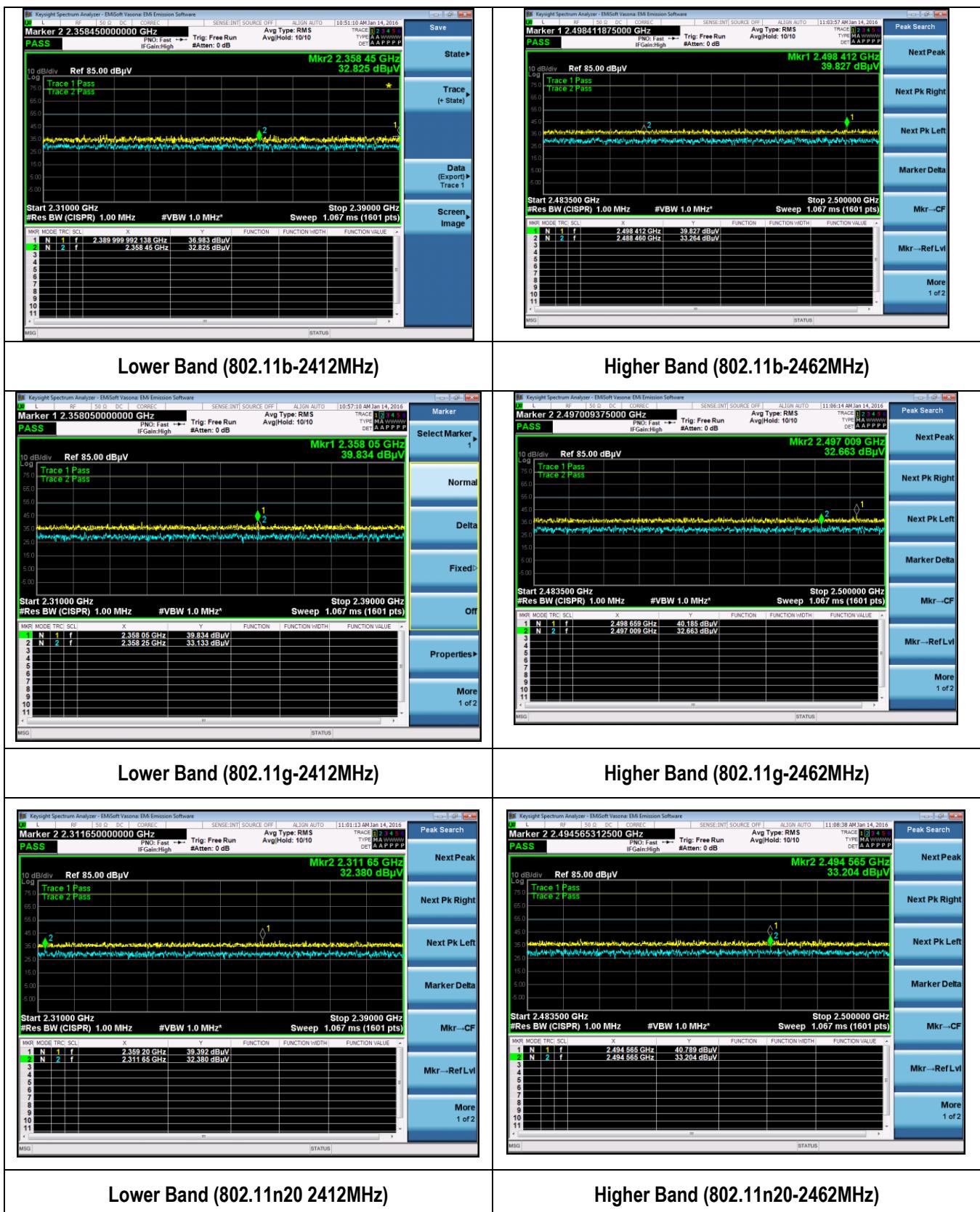
### Above 1GHz – 802.11n20 – 2437MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4092.71	36.96	8.74	11.82	57.52	Peak Max	V	156	133	74	-16.48	Pass
17488.70	35.71	16.79	10.36	62.86	Peak Max	V	170	298	74	-11.14	Pass
6079.12	35.99	10.58	10.88	57.45	Peak Max	V	155	233	74	-16.55	Pass
4092.71	25.38	8.74	11.82	45.93	Average Max	V	156	133	54	-8.07	Pass
17488.70	23.04	16.79	10.36	50.20	Average Max	V	170	298	54	-3.80	Pass
6079.12	24.53	10.58	10.88	45.98	Average Max	V	155	233	54	-8.02	Pass

### Above 1GHz – 802.11n20 – 2462MHz

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
4291.98	36.68	9.22	10.97	56.88	Peak Max	V	111	150	74	-17.12	Pass
17434.95	34.88	16.78	10.20	61.87	Peak Max	V	227	38	74	-12.13	Pass
6280.82	35.53	10.83	10.40	56.75	Peak Max	V	185	355	74	-17.25	Pass
4291.98	24.98	9.22	10.97	45.18	Average Max	V	111	150	54	-8.82	Pass
17434.95	22.84	16.78	10.20	49.83	Average Max	V	227	38	54	-4.17	Pass
6280.82	24.14	10.83	10.40	45.36	Average Max	V	185	355	54	-8.64	Pass

## Radiated Restricted Band Test Results (Above 1GHz)



## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
<b>Conducted Emissions</b>						
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input checked="" type="checkbox"/>
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input checked="" type="checkbox"/>
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	<input type="checkbox"/>
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	<input checked="" type="checkbox"/>
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/11/2015	1 Year	08/11/2016	<input checked="" type="checkbox"/>
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2015	1 Year	08/11/2016	<input checked="" type="checkbox"/>
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	<input checked="" type="checkbox"/>
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	<input checked="" type="checkbox"/>
<b>RF Conducted Measurement</b>						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input checked="" type="checkbox"/>
Test Equity Environment Chamber	1007H	61201	07/31/2015	1 Year	07/31/2016	<input checked="" type="checkbox"/>
USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	<input checked="" type="checkbox"/>

## Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		<b>Radio &amp; Telecommunications Terminal Equipment:</b> EN45001 – EN ISO/IEC 17025
		<b>Electromagnetic Compatibility:</b> EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)	 	Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		<b>(Phase II)</b> OFCA Foreign Certification Body for Radio and Telecom
		<b>(Phase I)</b> Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		<b>Radio:</b> Scope A – All Radio Standard Specification in Category I
		<b>Telecom:</b> CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		<b>Radio:</b> A1. Terminal equipment for purpose of calling <b>Telecom:</b> B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		<b>EMI:</b> KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI <b>EMS:</b> KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
Taiwan NCC CAB Recognition		<b>Radio:</b> RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
Taiwan BSMI CAB Recognition		<b>Telecom:</b> President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		<b>EMC:</b> AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4 <b>Radio communications:</b> AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771

		<b>Telecommunications:</b> AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2