

# RF TEST REPORT



Report No.: 17070445-FCC-R4

Supersede Report No.: N/A

Applicant	Telecell Mobile (H.K) Ltd.	
Product Name	Mobile Phone	
Model No.	ATRIUM II F55L2	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	June 16 to August 09, 2017	
Issue Date	August 10, 2017	
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"/>
Loren Luo	David Huang	
Loren Luo Test Engineer	David Huang Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

**SIEMIC (SHENZHEN-CHINA) LABORATORIES**

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## Laboratories Introduction

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



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

### 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
17070445-FCC-R4	NONE	Original	August 10, 2017

## 2. Customer information

Applicant Name	Telecell Mobile (H.K) Ltd.
Applicant Add	RM 801 Metro Ctr II, 21 Lam Hing Street, Kln Bay, Hong Kong
Manufacturer	Telecell Mobile (H.K) Ltd.
Manufacturer Add	RM 801 Metro Ctr II, 21 Lam Hing Street, Kln Bay, Hong Kong

## 3. Test site information

Test Lab A:

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.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

Test Lab B:

Lab performing tests	SIEMIC (Nanjing-China) Laboratories
Lab Address	2-1 Longcang Avenue Yuhua Economic and Technology Development Park, Nanjing, China
FCC Test Site No.	694825
IC Test Site No.	4842B-1
Test Software	EZ_EMC(ver.lcp-03A1)

Note: We just perform Radiated Spurious Emission above 18GHz in the test Lab. B.

## 4. Equipment under Test (EUT) Information

Description of EUT:	Mobile Phone
Main Model:	ATRIUM II F55L2
Serial Model:	N/A
Date EUT received:	June 15, 2017
Test Date(s):	June 16 to August 09, 2017
Equipment Category :	DTS
Antenna Gain:	GSM850: -1.31dBi PCS1900: -0.35dBi UMTS-FDD Band V: -1.31dBi UMTS-FDD Band IV: -0.53dBi UMTS-FDD Band II: -0.35dBi LTE Band II: -0.82dBi LTE Band IV: -0.24dBi LTE Band V: -1.31dBi LTE Band VII: 0.62dBi LTE Band XII: -1.68dBi LTE Band XVII: -1.68dBi WIFI: -0.49dBi Bluetooth/BLE:-0.49dBi GPS: -0.94dBi
Antenna Type:	PIFA antenna
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK,8PSK UMTS-FDD: QPSK LTE Band: QPSK, 16QAM 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK GPS:BPSK

GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz  
PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz  
UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz  
UMTS-FDD Band IV TX: 1712.4 ~ 1752.6 MHz;  
RX : 2112.4 ~ 2152.6 MHz  
UMTS-FDD Band II TX: 1852.4 ~ 1907.6 MHz;

RF Operating Frequency (ies):	LTE Band IV TX: 1710.7 ~ 1754.3 MHz; RX : 2110.7~ 2154.3 MHz LTE Band V TX: 824.7~ 848.3 MHz; RX : 869.7 ~ 893.3MHz LTE Band VII TX: 2502.5 ~ 2567.5 MHz; RX : 2622.5 ~ 2687.5 MHz LTE Band XII TX:699.7 ~ 715.3 MHz; RX : 729.7~ 745.3MHz LTE Band XVII TX: 706.5 ~ 713.5 MHz; RX : 736.5 ~ 743.5 MHz WIFI: 802.11b/g/n(20M): 2412-2462 MHz WIFI: 802.11n(40M): 2422-2452 MHz Bluetooth& BLE: 2402-2480 MHz GPS: 1575.42 MHz
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Max. Output Power: 802.11g: 8.48dBm  
802.11n(20M): 8.76dBm  
802.11n(40M): 8.72dBm

Number of Channels:	UMTS-FDD Band IV: 202CH
	UMTS-FDD Band II: 277CH
	WIFI :802.11b/g/n(20M): 11CH
	WIFI :802.11n(40M): 7CH
	Bluetooth: 79CH
	BLE: 40CH
	GPS:1CH

Port: USB Port, Earphone Port

### Adapter:

Model: TPA-46B050100UU

Input Power:	Input: AC100-240V~50/60Hz,0.2A Output: DC 5.0V,1000mA Battery:
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Spec: 3.8V

Trade Name : FIGO

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

FCC ID: 2ADX3F55L2

## 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 Restricted Frequency Bands	Compliance
§15.207 (a),	AC Power Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	Compliance

### Measurement Uncertainty

Emissions		
Test Item	Description	Uncertainty
Band-Edge & Unwanted Emissions into Restricted Frequency Bands and Radiated Emissions & Unwanted Emissions into Restricted Frequency Bands	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 3 antennas:

A permanently attached PIFA antenna for GSM/PCS/ UMTS-FDD Band V/ IV /II, the gain is -1.31dBi for GSM850/ UMTS-FDD Band V, the gain is -0.35dBi for PCS1900/ UMTS-FDD Band II, the gain is -0.53dBi for UMTS-FDD Band IV.

A permanently attached PIFA antenna for LTE Band II/ IV/ V/ VII/ XII/ XVII, the gain is -0.82dBi for LTE Band II, the gain is -0.24dBi for LTE Band IV, the gain is -1.31dBi for LTE Band V, the gain is 0.62dBi for LTE Band VII, the gain is -1.68dBi for LTE Band XII/ XVII.

A permanently attached PIFA antenna for Bluetooth/BLE/WIFI/GPS, the gain is -0.49dBi for WIFI/Bluetooth/BLE, the gain is -0.94dBi for GPS.

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

**Result:** Compliance.

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

Temperature	25 °C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2017
Tested By :	Loren Luo

	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

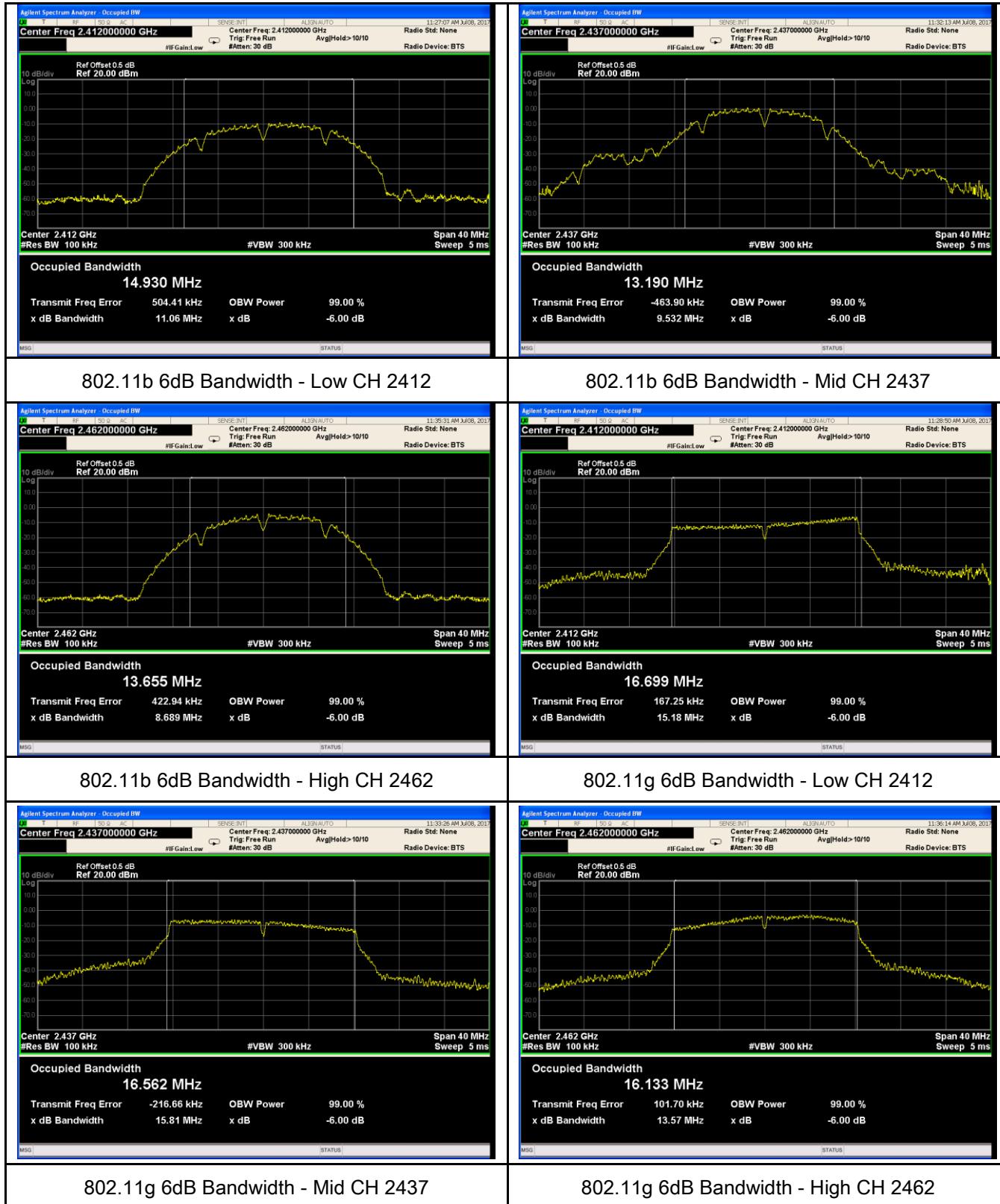
Test Plot  Yes (See below)  N/A

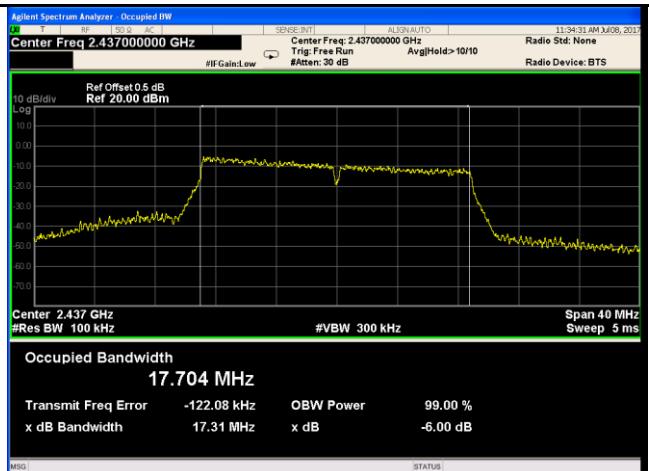
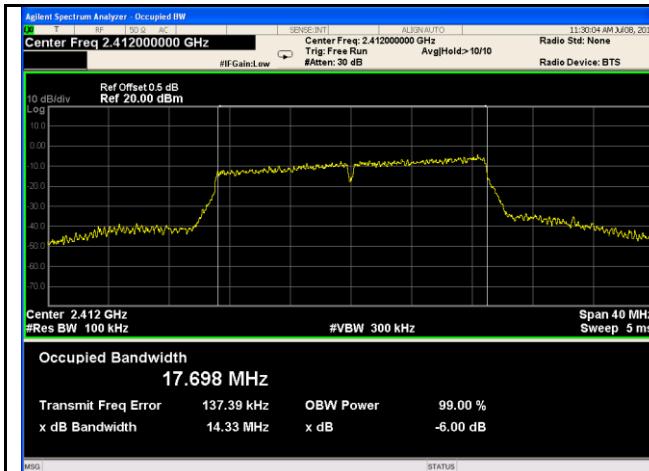
#### Measurement result

Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	11.06	17.25	$\geq 0.5$
	Mid	2437	9.532	17.01	$\geq 0.5$
	High	2462	8.689	15.70	$\geq 0.5$
802.11g	Low	2412	15.18	18.94	$\geq 0.5$
	Mid	2437	15.81	18.92	$\geq 0.5$
	High	2462	13.57	18.56	$\geq 0.5$
802.11n (20M)	Low	2412	14.33	19.17	$\geq 0.5$
	Mid	2437	17.31	19.15	$\geq 0.5$
	High	2462	14.19	18.76	$\geq 0.5$
802.11n (40M)	Low	2422	35.29	38.18	$\geq 0.5$
	Mid	2437	35.35	38.37	$\geq 0.5$
	High	2452	35.93	39.22	$\geq 0.5$

## Test Plots

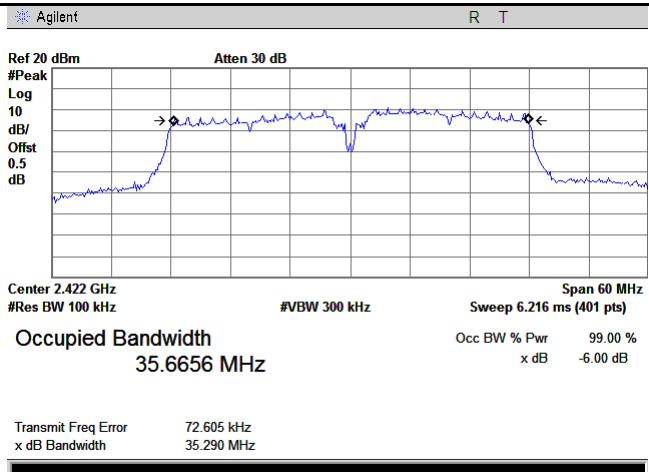
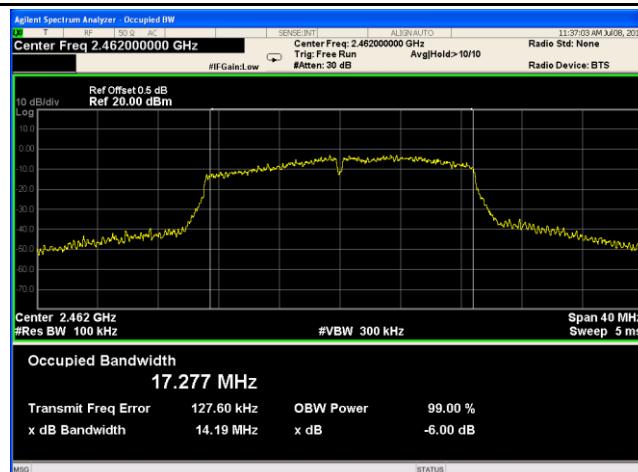
### 6dB Bandwidth measurement result





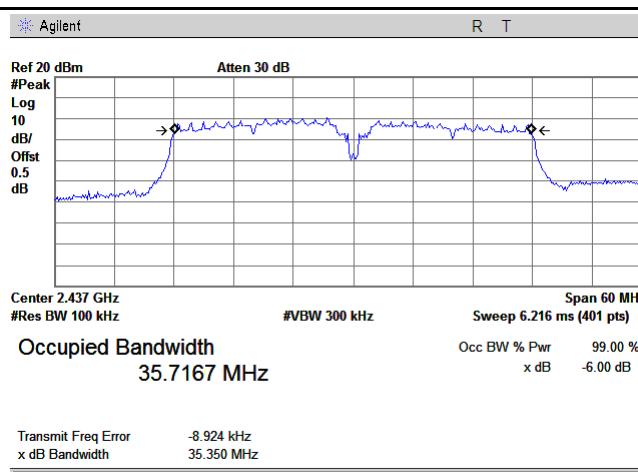
### 802.11n20 6dB Bandwidth - Low CH 2412

### 802.11n20 6dB Bandwidth - Mid CH 2437



### 802.11n20 6dB Bandwidth - High CH 2462

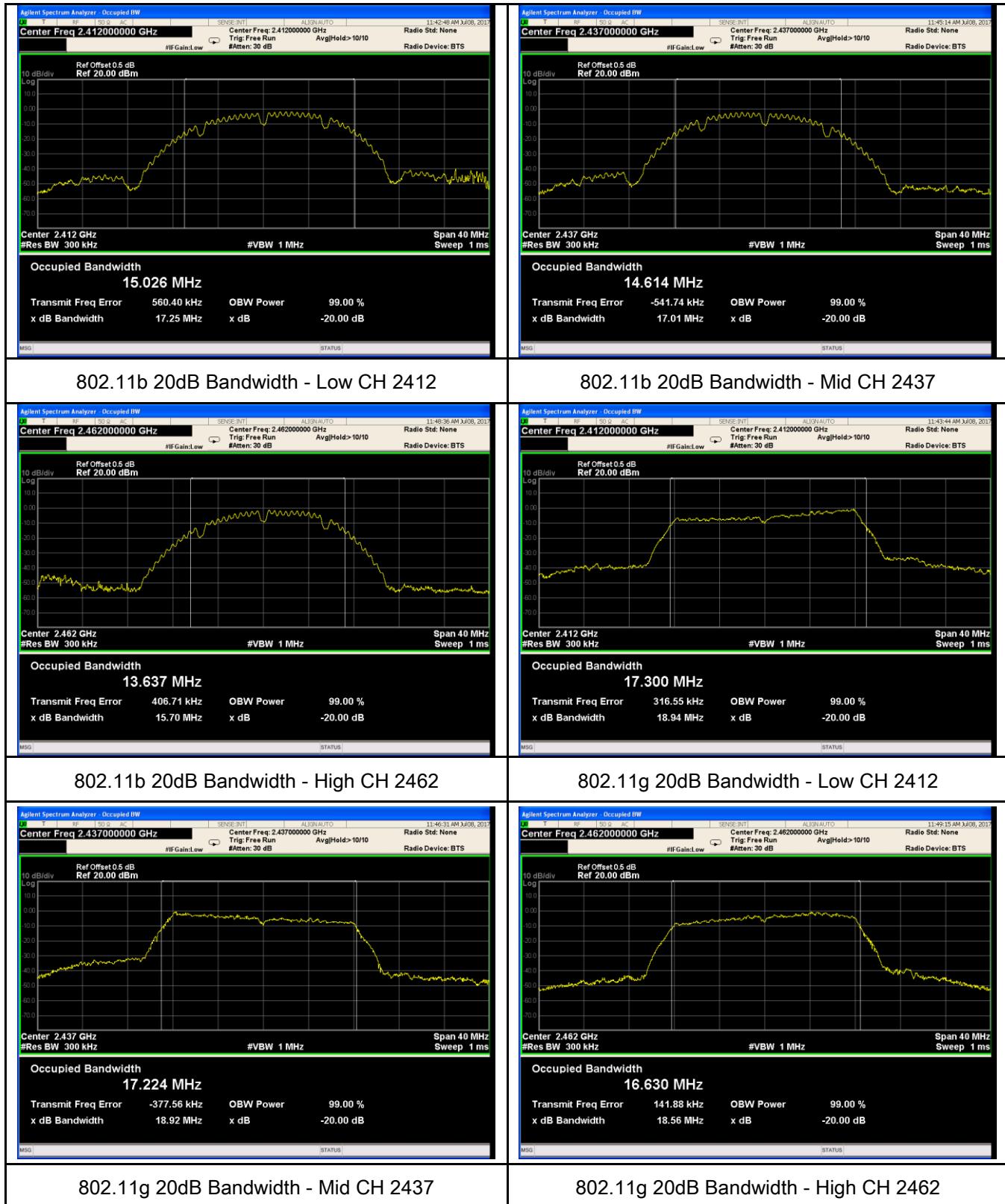
### 802.11n40 6dB Bandwidth - Low CH 2422

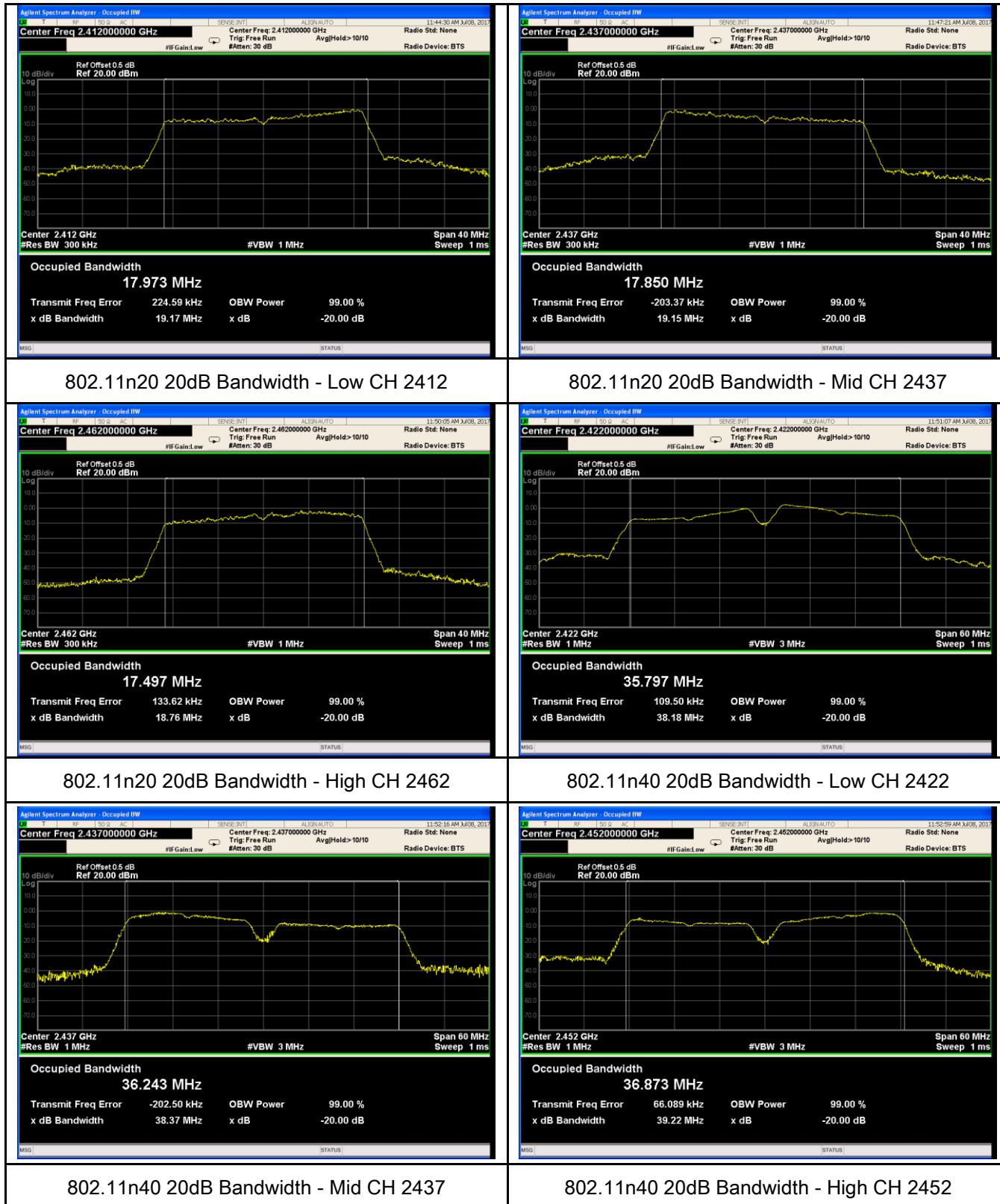


### 802.11n40 6dB Bandwidth - Mid CH 2437

### 802.11n40 6dB Bandwidth - High CH 2452

## 20 dB Bandwidth measurement result

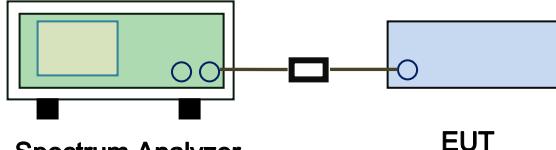




### 6.3 Maximum Output Power

Temperature	25 °C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2017
Tested By :	Loren Luo

#### Requirement(s):

Spec	Item	Requirement	Applicable
§15.247(b) (3), 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)	DTS in 902-928MHz, 2400-2483.5MHz: $\leq$ 1 Watt	<input checked="" type="checkbox"/>
Test Setup		 <b>Spectrum Analyzer</b> <b>EUT</b>	
Test Procedure		<p>558074 D01 DTS MEAS Guidance v03r03, 9.1.2 Integrated band power method</p> <p>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</math> 3 x RBW.</li> <li>- d) Number of points in sweep <math>\geq</math> 2 <math>\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;</math> 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum</li> </ul>	

	<p>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

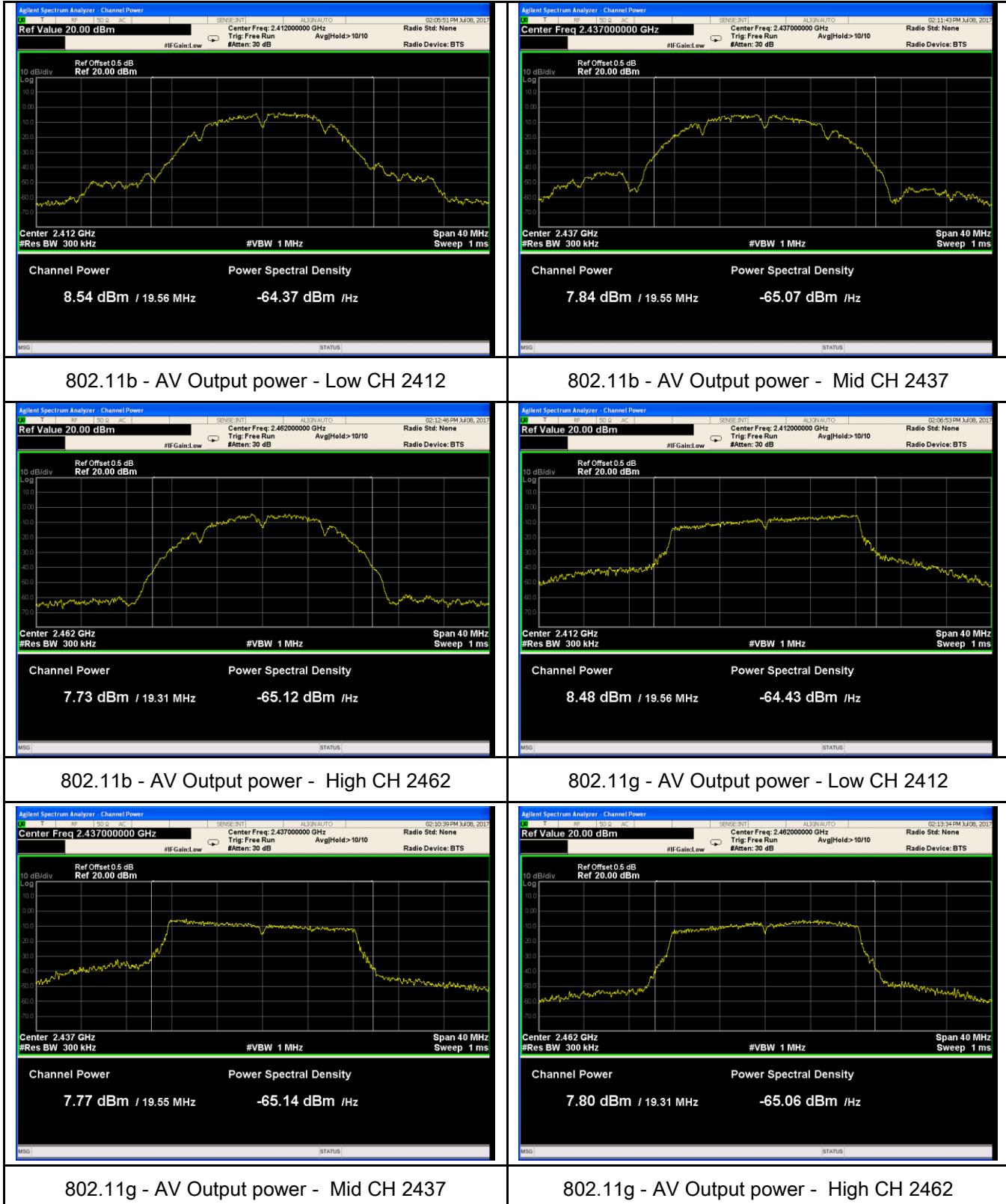
Test Plot  Yes (See below)  N/A

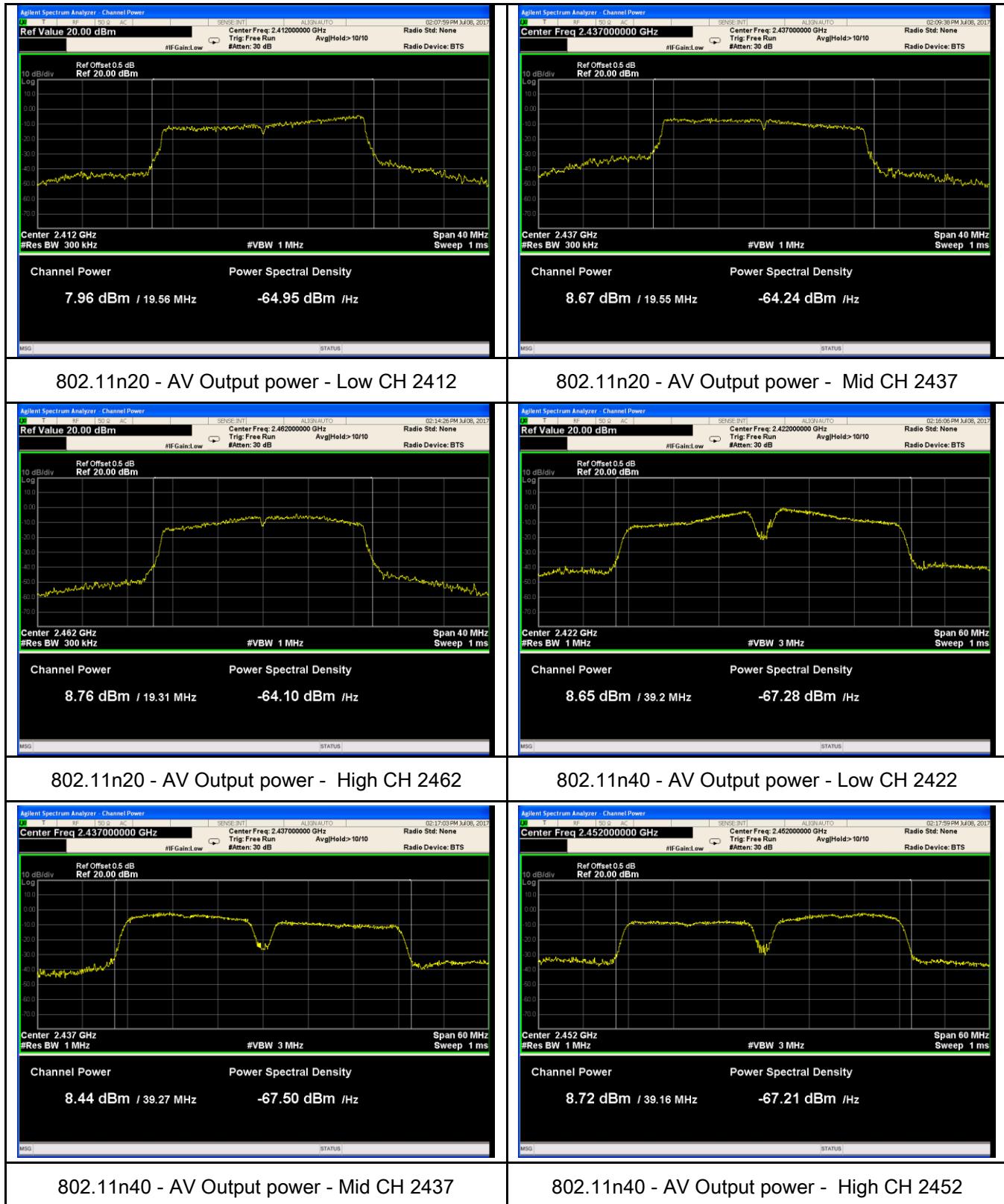
#### Output Power measurement result

Type	Test mode	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	<b>8.54</b>	30	Pass
		Mid	2437	7.84	30	Pass
		High	2462	7.73	30	Pass
	802.11g	Low	2412	<b>8.48</b>	30	Pass
		Mid	2437	7.77	30	Pass
		High	2462	7.80	30	Pass
	802.11n (20M)	Low	2412	7.96	30	Pass
		Mid	2437	8.67	30	Pass
		High	2462	<b>8.76</b>	30	Pass
	802.11n (40M)	Low	2422	8.65	30	Pass
		Mid	2437	8.44	30	Pass
		High	2452	<b>8.72</b>	30	Pass

## Test Plots

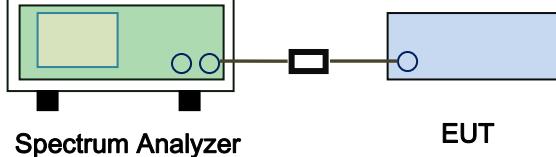
### The Average Power





## 6.4 Power Spectral Density

Temperature	25 °C
Relative Humidity	50%
Atmospheric Pressure	1008mbar
Test date :	July 08, 2017
Tested By :	Loren Luo

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		 <b>Spectrum Analyzer</b> <b>EUT</b>	
Test Procedure		<p>558074 D01 DTS MEAS Guidance v03r03, 10.2 power spectral density method power spectral density measurement procedure</p> <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	

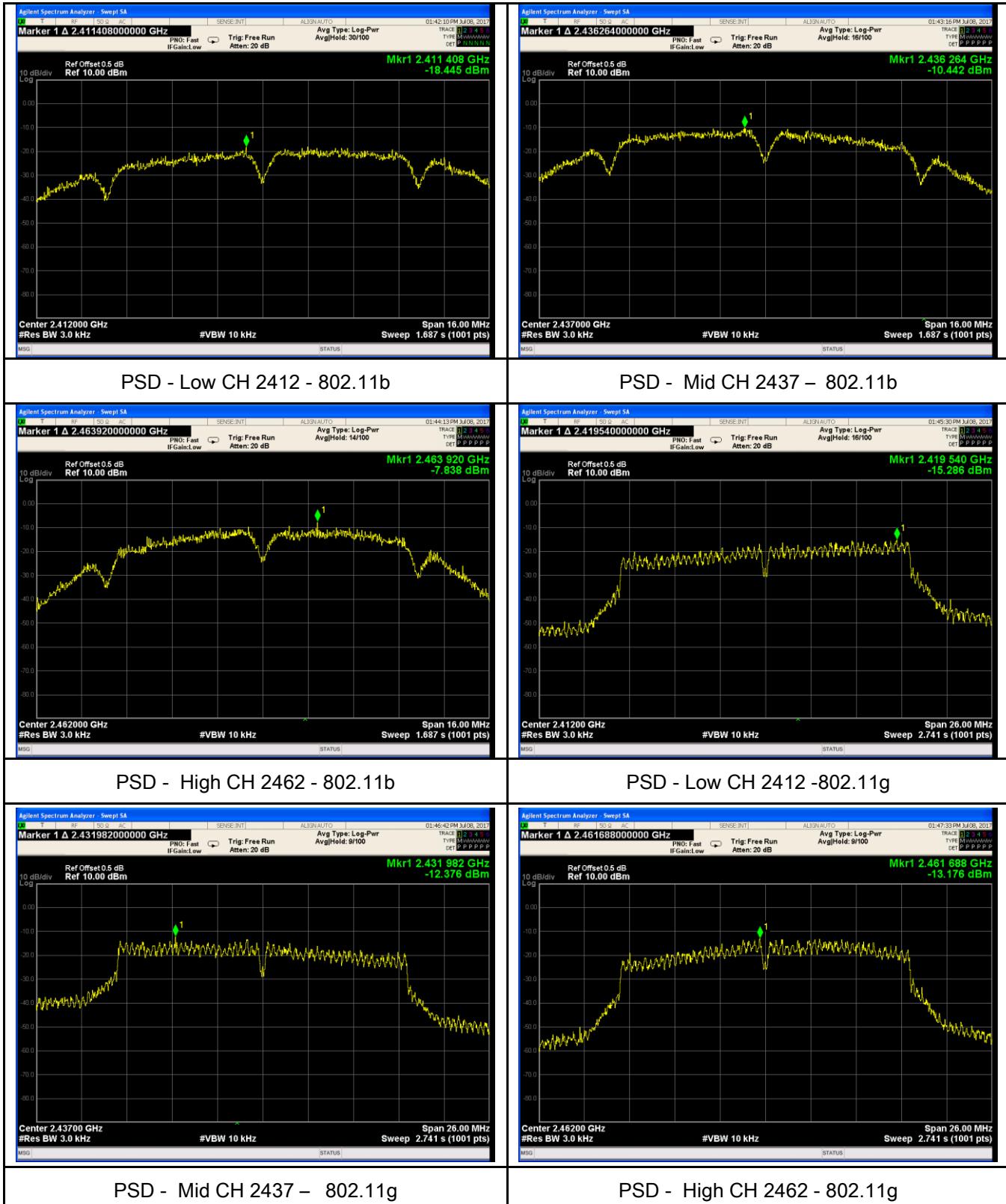
Test Data  Yes  N/A  
 Test Plot  Yes (See below)  N/A

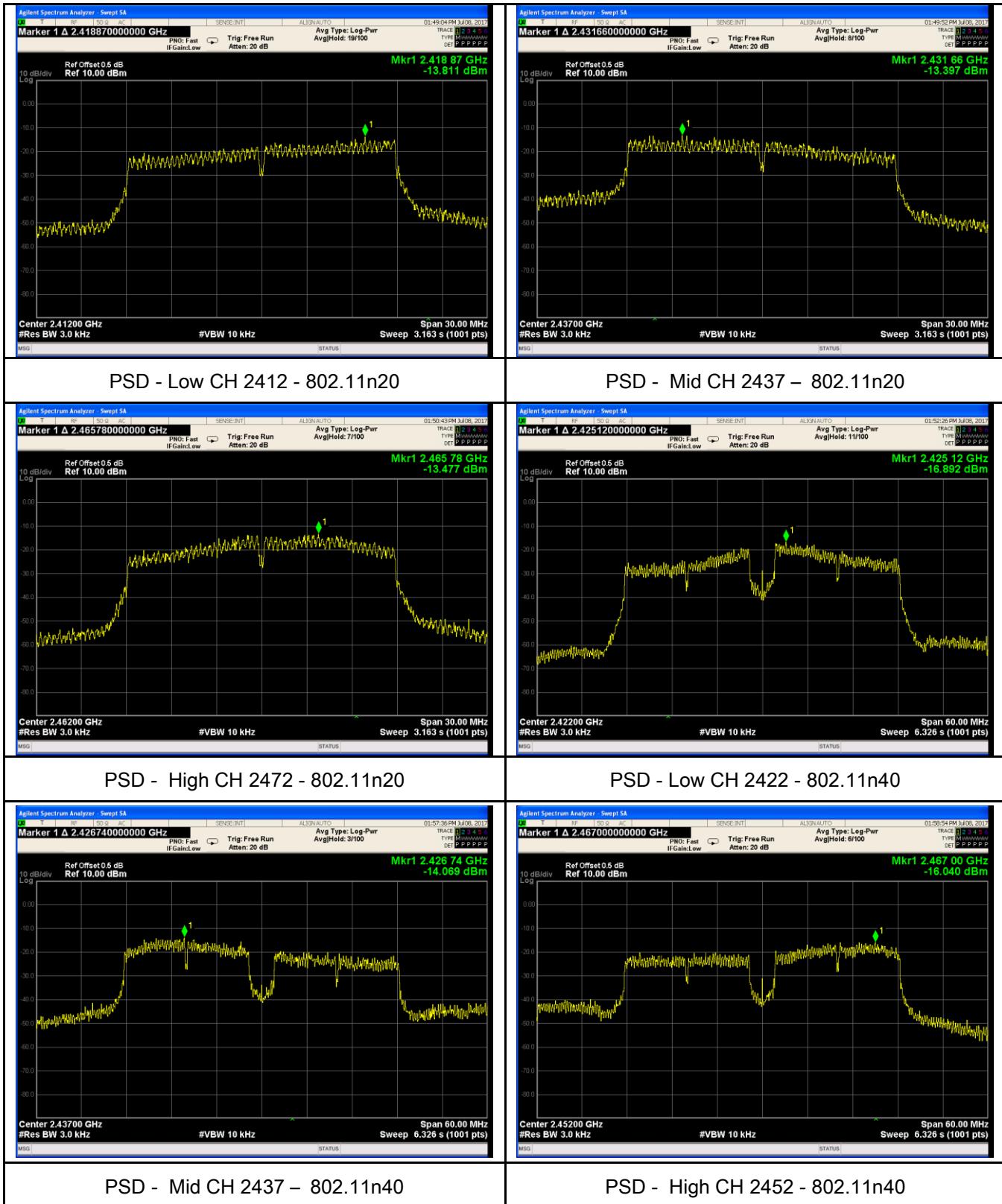
### Power Spectral Density measurement result

Type	Test mode	CH	Freq (MHz)	PSD	Limit (dBm)	Result
				(dBm)		
PSD	802.11b	Low	2412	-18.445	8	Pass
		Mid	2437	-10.442	8	Pass
		High	2462	-7.838	8	Pass
	802.11g	Low	2412	-15.286	8	Pass
		Mid	2437	-12.376	8	Pass
		High	2462	-13.176	8	Pass
	802.11n (20M)	Low	2412	-13.811	8	Pass
		Mid	2437	-13.397	8	Pass
		High	2462	-13.477	8	Pass
	802.11n (40M)	Low	2422	-16.892	8	Pass
		Mid	2437	-14.069	8	Pass
		High	2452	-16.040	8	Pass

## Test Plots

### Power Spectral Density measurement result

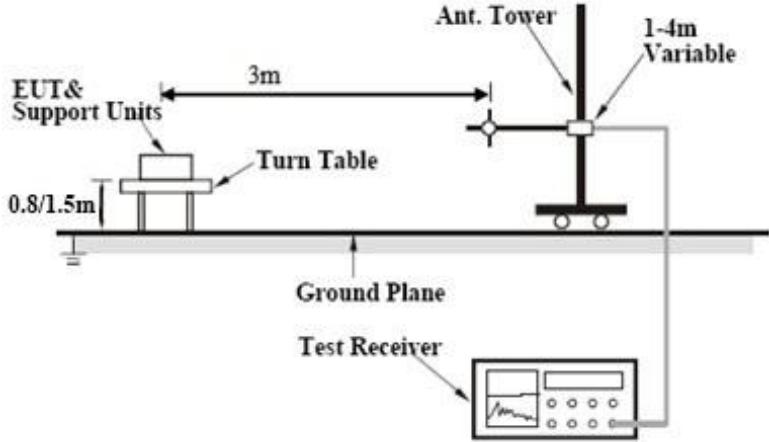




## 6.5 Band-Edge & Unwanted Emissions into Restricted Frequency Bands

Temperature	23 °C
Relative Humidity	51%
Atmospheric Pressure	1020mbar
Test date :	July 30, 2017
Tested By :	Loren Luo

### 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. An 'EUT &amp; Support Units' is positioned on a 'Turn Table' at a height of '0.8/1.5m' above a 'Ground Plane'. A 'Test Receiver' is connected to the turn table. A '1-4m Variable' length 'Ant. Tower' is mounted on the turn table, extending vertically upwards. A horizontal line connects the center of the turn table to the base of the antenna tower, labeled '3m'.</p>		
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> </ul>		

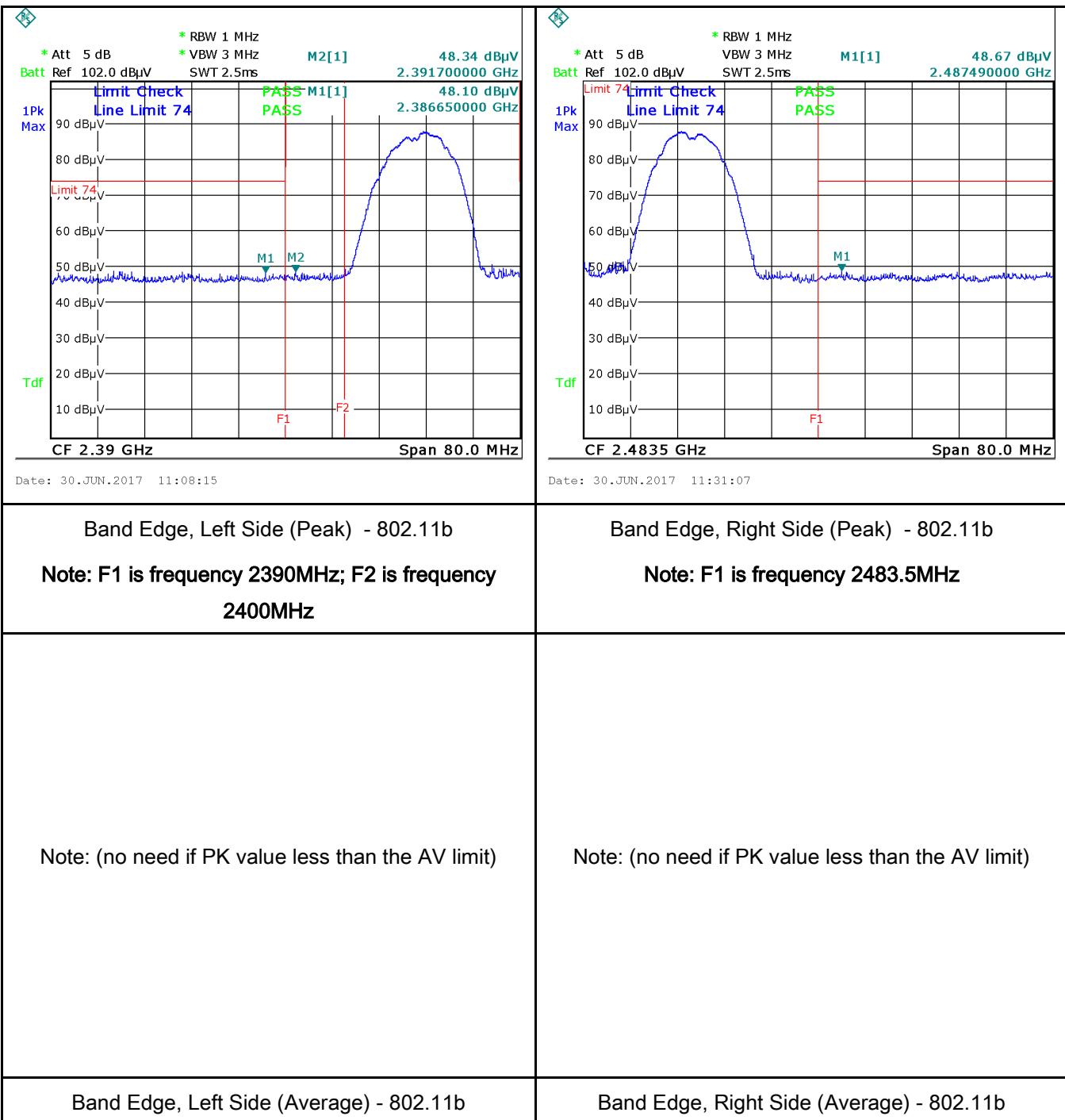
	<ul style="list-style-type: none"> <li>- 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below:           <ul style="list-style-type: none"> <li>a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz.</li> <li>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.</li> <li>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.</li> </ul> </li> <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

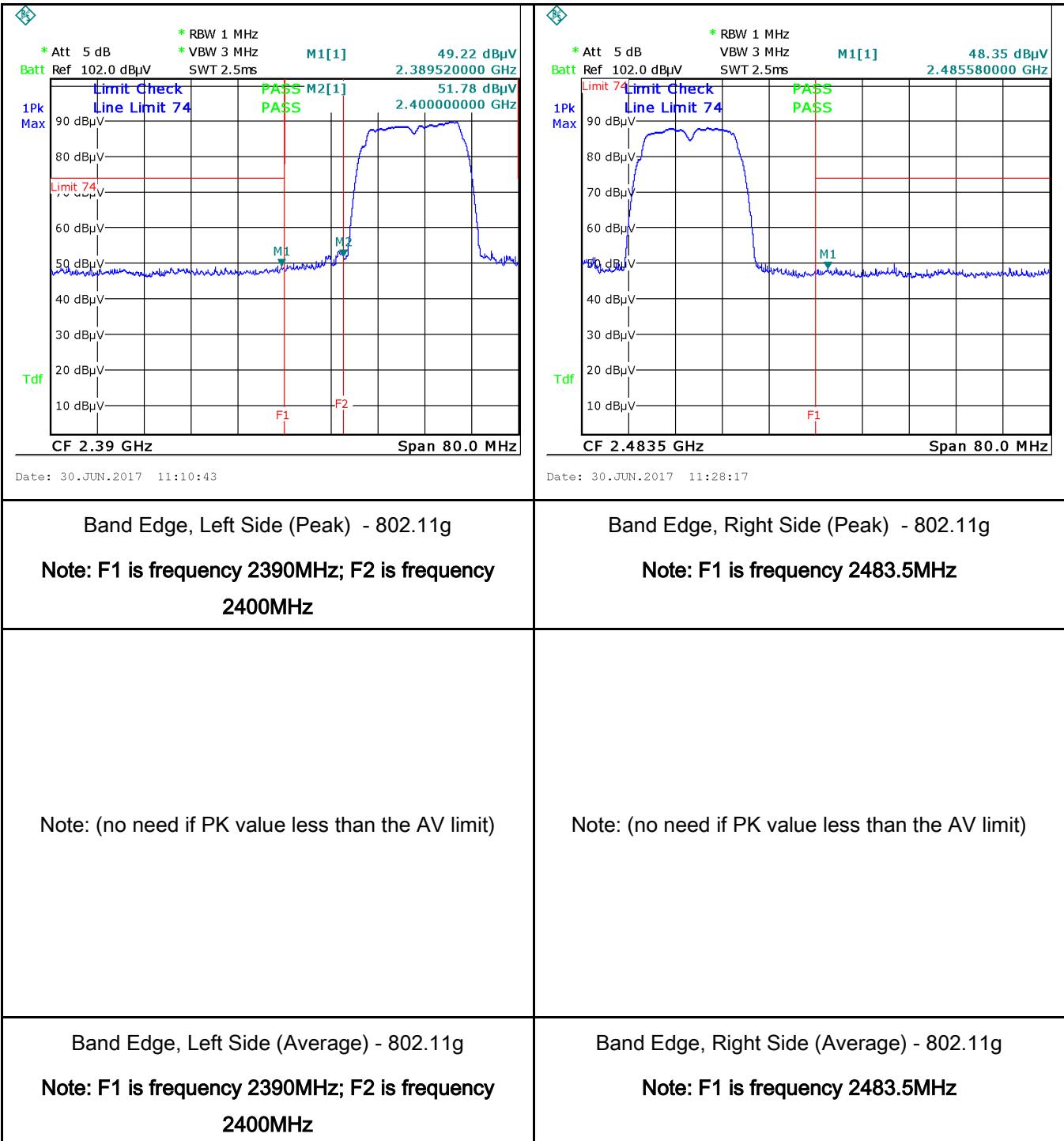
Test Plot  Yes (See below)  N/A

## Test Plots

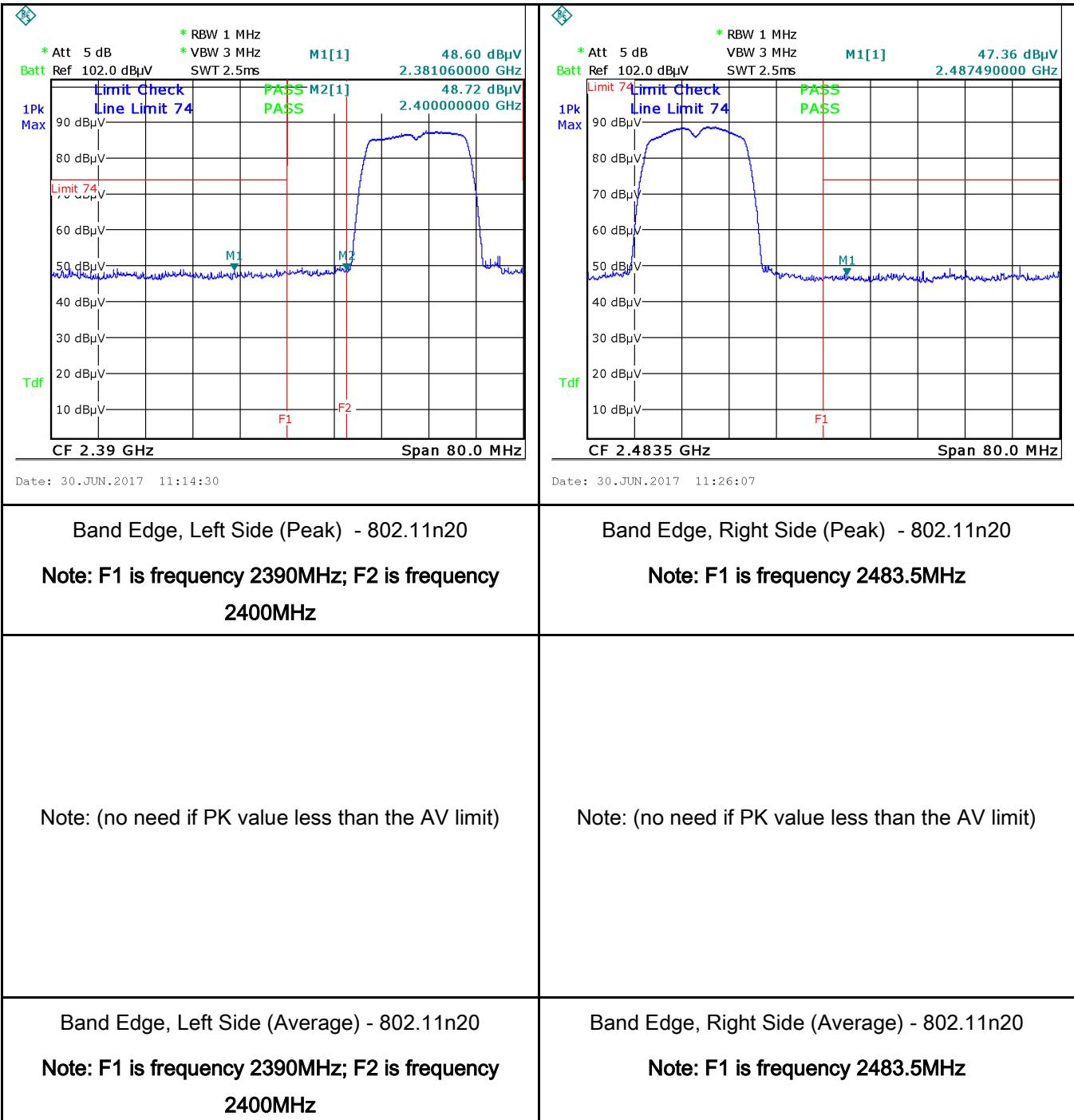
### Band Edge measurement result



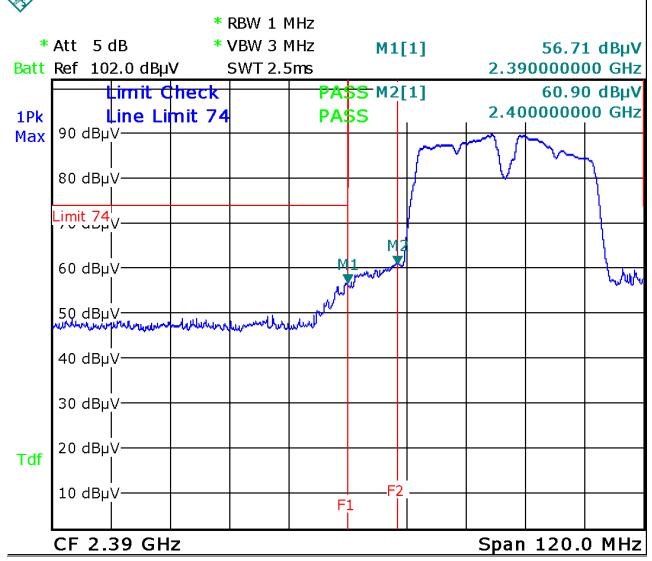
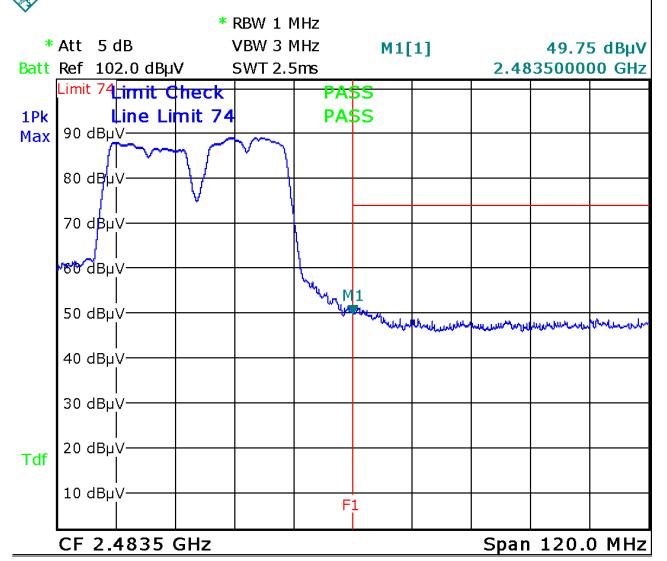
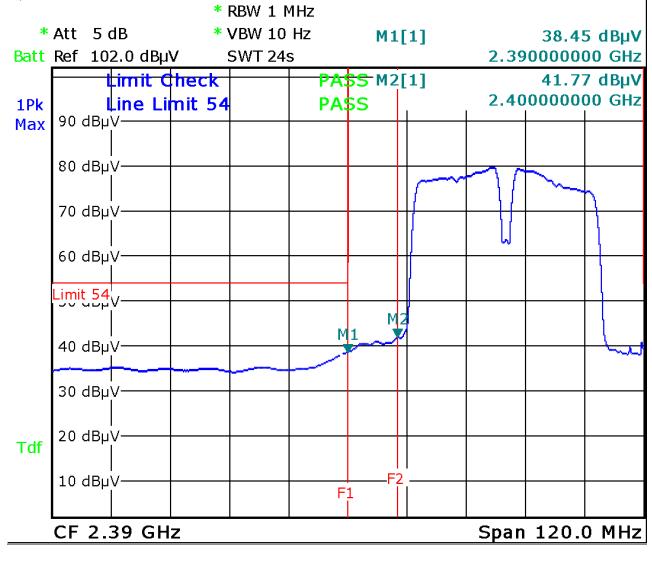
Note: Both Horizontal and vertical polarities were investigated



Note: Both Horizontal and vertical polarities were investigated



Note: Both Horizontal and vertical polarities were investigated

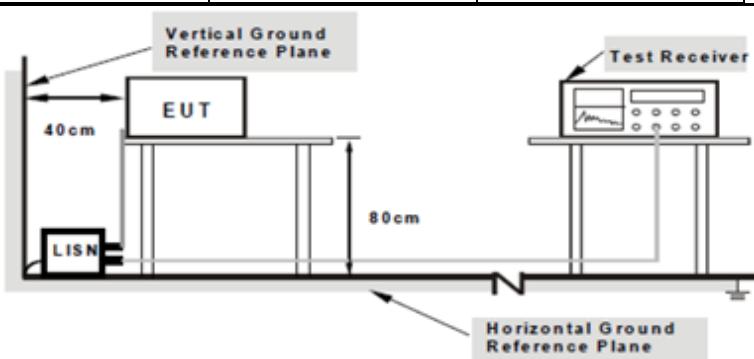
	
<p>Date: 30.JUN.2017 11:17:09</p> <p>Band Edge, Left Side (Peak) - 802.11n40</p> <p><b>Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz</b></p>	<p>Date: 30.JUN.2017 11:22:09</p> <p>Band Edge, Right Side (Peak) - 802.11n40</p> <p><b>Note: F1 is frequency 2483.5MHz</b></p>
	<p>Note: (no need if PK value less than the AV limit)</p>
<p>Date: 30.JUN.2017 11:19:01</p> <p>Band Edge, Left Side (Average) - 802.11n40</p> <p><b>Note: F1 is frequency 2390MHz; F2 is frequency 2400MHz</b></p>	<p>Band Edge, Right Side (Average) - 802.11n40</p> <p><b>Note: F1 is frequency 2483.5MHz</b></p>

Note: Both Horizontal and vertical polarities were investigated

## 6.6 AC Power Line Conducted Emissions

Temperature	25 °C
Relative Humidity	55%
Atmospheric Pressure	1012mbar
Test date :	July 10, 2017
Tested By :	Loren Luo

### Requirement(s):

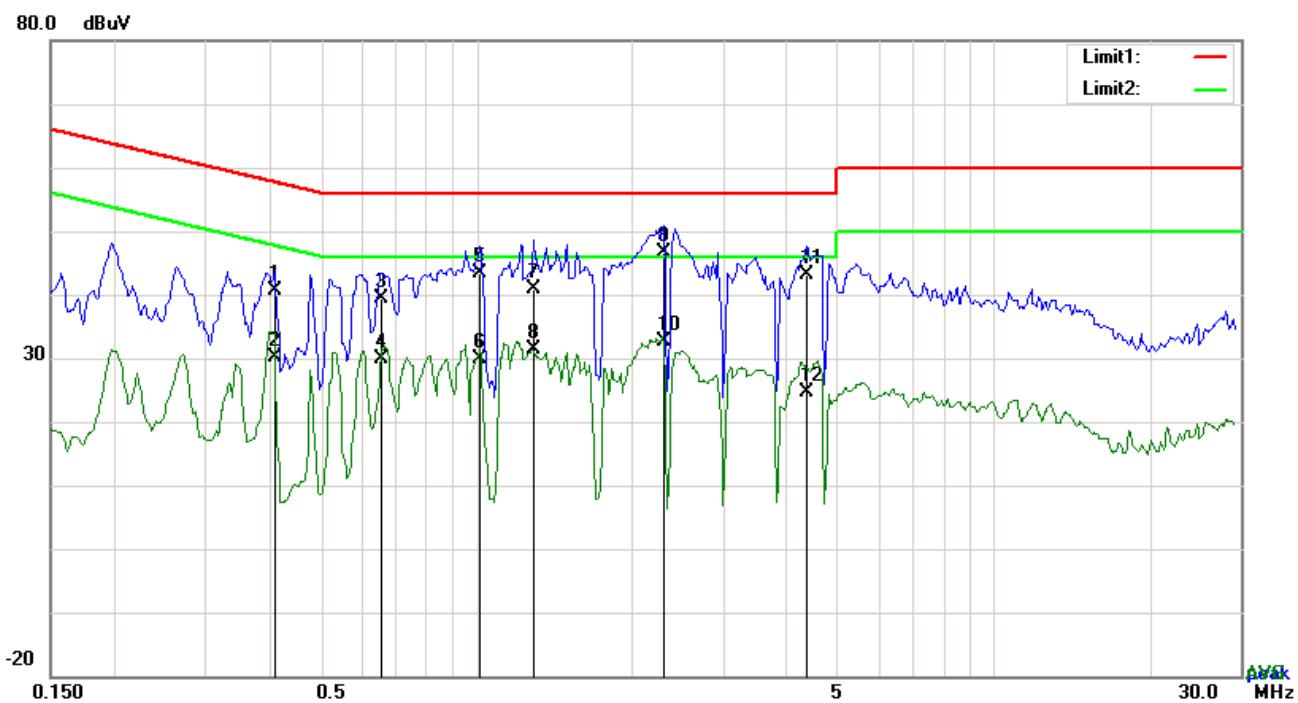
Spec	Item	Requirement	Applicable														
47CFR§15.207, RSS210 (A8.1)	a)	<p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 [mu] H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequencies ranges.</p> <table border="1"> <thead> <tr> <th rowspan="2">Frequency ranges (MHz)</th> <th colspan="2">Limit (dB<math>\mu</math>V)</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 (dB $\mu$ V)		QP	Average	0.15 ~ 0.5	66 – 56	56 – 46	0.5 ~ 5	56	46	5 ~ 30	60	50	<input checked="" type="checkbox"/>
Frequency ranges (MHz)	Limit (dB $\mu$ V)																
	QP	Average															
0.15 ~ 0.5	66 – 56	56 – 46															
0.5 ~ 5	56	46															
5 ~ 30	60	50															
Test Setup	 <p><b>Note:</b> 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>																
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>																

	<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

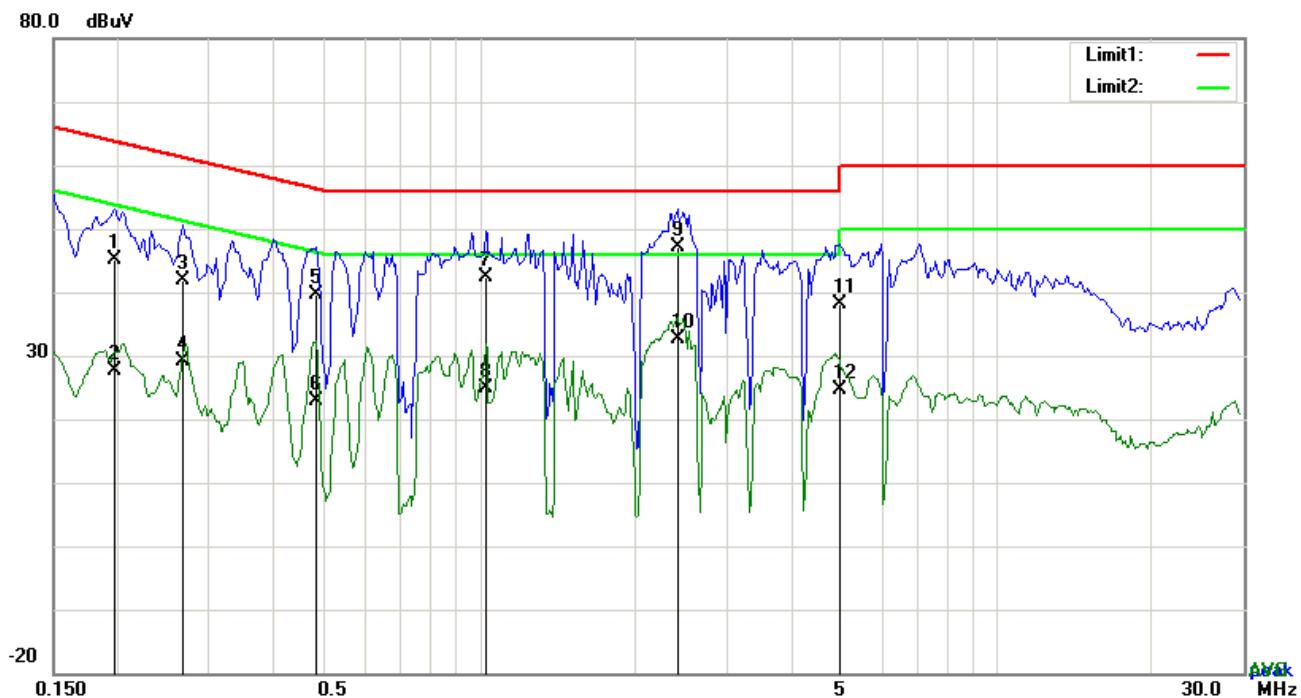
**Test Mode:** Transmitting Mode



Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	L1	0.4074	30.67	QP	10.03	40.70	57.70	-17.00
2	L1	0.4074	20.17	AVG	10.03	30.20	47.70	-17.50
3	L1	0.6570	29.26	QP	10.03	39.29	56.00	-16.71
4	L1	0.6570	19.88	AVG	10.03	29.91	46.00	-16.09
5	L1	1.0197	33.44	QP	10.03	43.47	56.00	-12.53
6	L1	1.0197	19.74	AVG	10.03	29.77	46.00	-16.23
7	L1	1.2927	30.75	QP	10.03	40.78	56.00	-15.22
8	L1	1.2927	21.32	AVG	10.03	31.35	46.00	-14.65
9	L1	2.2989	36.62	QP	10.05	46.67	56.00	-9.33
10	L1	2.2989	22.60	AVG	10.05	32.65	46.00	-13.35
11	L1	4.3533	33.10	QP	10.07	43.17	56.00	-12.83
12	L1	4.3533	14.51	AVG	10.07	24.58	46.00	-21.42

**Test Mode:** Transmitting Mode

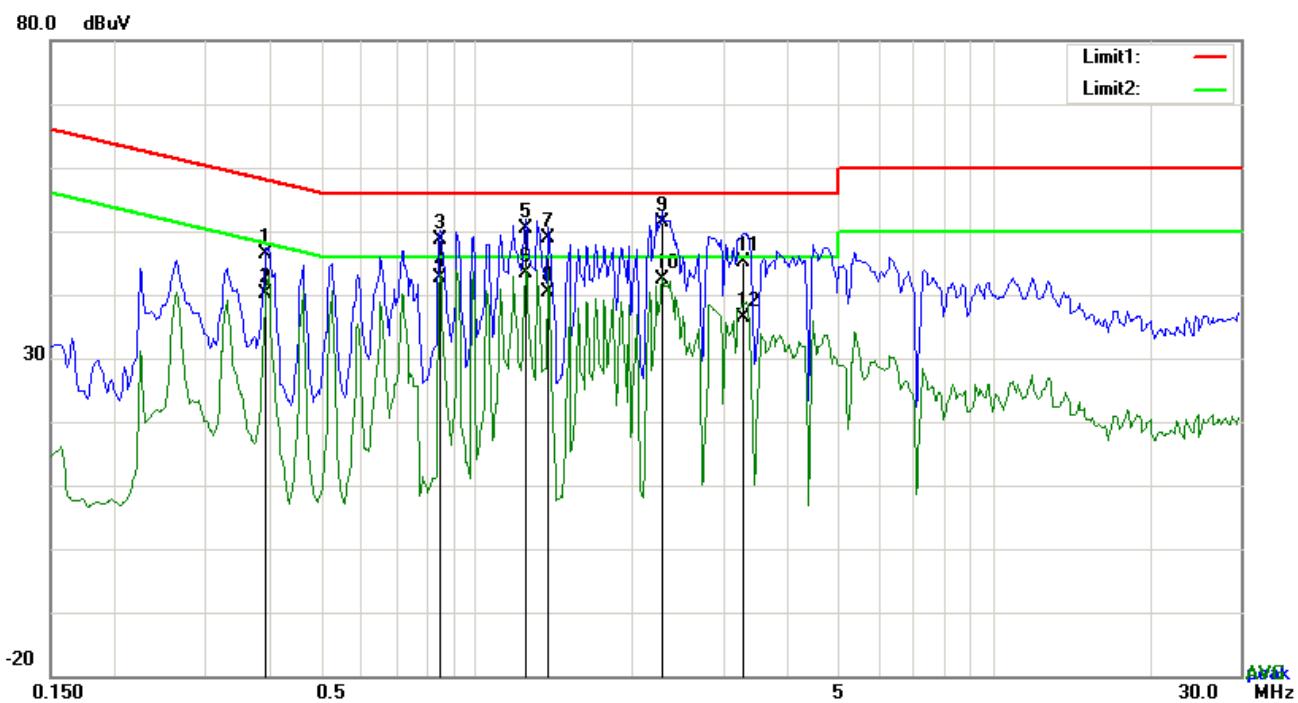


### Test Data

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

No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	N	0.1968	35.20	QP	10.02	45.22	63.74	-18.52
2	N	0.1968	17.62	AVG	10.02	27.64	53.74	-26.10
3	N	0.2670	31.97	QP	10.02	41.99	61.21	-19.22
4	N	0.2670	19.14	AVG	10.02	29.16	51.21	-22.05
5	N	0.4854	29.50	QP	10.02	39.52	56.25	-16.73
6	N	0.4854	12.79	AVG	10.02	22.81	46.25	-23.44
7	N	1.0314	32.36	QP	10.03	42.39	56.00	-13.61
8	N	1.0314	14.89	AVG	10.03	24.92	46.00	-21.08
9	N	2.4120	37.00	QP	10.04	47.04	56.00	-8.96
10	N	2.4120	22.56	AVG	10.04	32.60	46.00	-13.40
11	N	4.9539	28.16	QP	10.07	38.23	56.00	-17.77
12	N	4.9539	14.45	AVG	10.07	24.52	46.00	-21.48

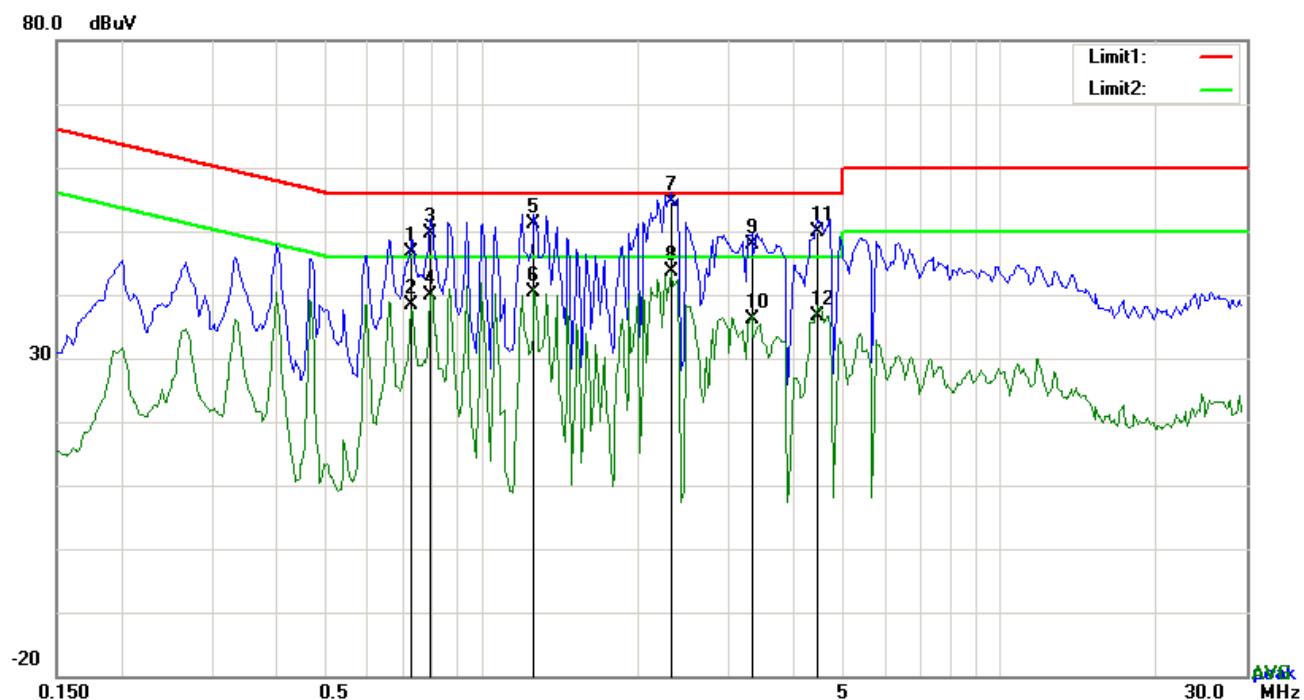
**Test Mode:** Transmitting Mode



#### Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	L1	0.3918	36.27	QP	10.03	46.30	58.03	-11.73
2	L1	0.3918	29.98	AVG	10.03	40.01	48.03	-8.02
3	L1	0.8520	38.69	QP	10.03	48.72	56.00	-7.28
4	L1	0.8520	32.52	AVG	10.03	42.55	46.00	-3.45
5	L1	1.2459	40.31	QP	10.03	50.34	56.00	-5.66
6	L1	1.2459	33.44	AVG	10.03	43.47	46.00	-2.53
7	L1	1.3746	38.77	QP	10.03	48.80	56.00	-7.20
8	L1	1.3746	30.41	AVG	10.03	40.44	46.00	-5.56
9	L1	2.2950	41.43	QP	10.05	51.48	56.00	-4.52
10	L1	2.2950	32.45	AVG	10.05	42.50	46.00	-3.50
11	L1	3.2847	34.96	QP	10.06	45.02	56.00	-10.98
12	L1	3.2847	26.43	AVG	10.06	36.49	46.00	-9.51

**Test Mode:** Transmitting Mode



**Test Data**

Phase Neutral Plot at 240Vac, 60Hz

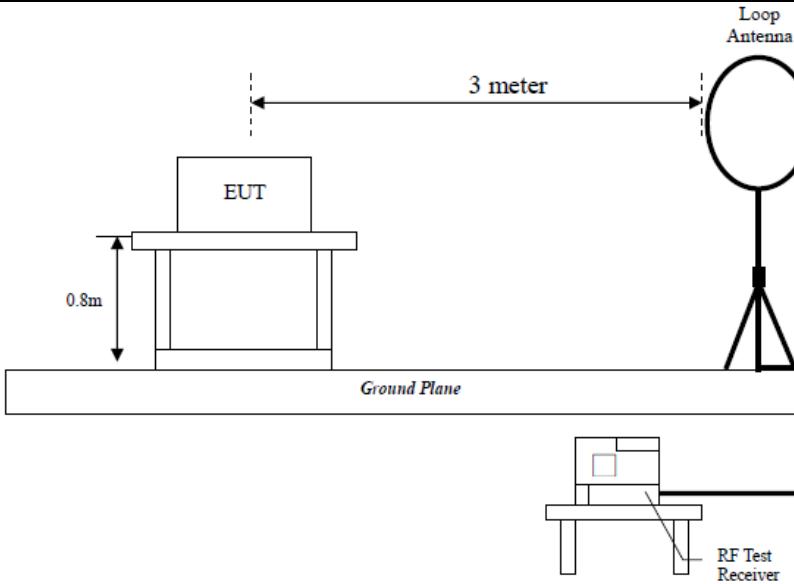
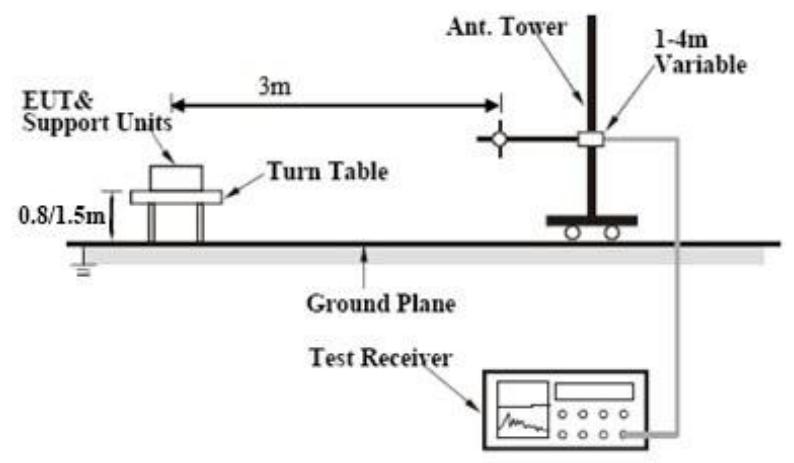
No.	P/L	Frequency (MHz)	Reading (dB $\mu$ V)	Detector	Corrected (dB)	Result (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
1	N	0.7311	36.64	QP	10.02	46.66	56.00	-9.34
2	N	0.7311	28.37	AVG	10.02	38.39	46.00	-7.61
3	N	0.7935	39.53	QP	10.03	49.56	56.00	-6.44
4	N	0.7935	29.89	AVG	10.03	39.92	46.00	-6.08
5	N	1.2576	41.00	QP	10.03	51.03	56.00	-4.97
6	N	1.2576	30.36	AVG	10.03	40.39	46.00	-5.61
7	N	2.3184	44.59	QP	10.04	54.63	56.00	-1.37
8	N	2.3184	33.71	AVG	10.04	43.75	46.00	-2.25
9	N	3.3159	37.92	QP	10.05	47.97	56.00	-8.03
10	N	3.3159	25.98	AVG	10.05	36.03	46.00	-9.97
11	N	4.4430	39.72	QP	10.06	49.78	56.00	-6.22
12	N	4.4430	26.63	AVG	10.06	36.69	46.00	-9.31

## 6.7 Radiated Spurious Emissions & Restricted Band

Temperature	25 °C
Relative Humidity	53%
Atmospheric Pressure	1005mbar
Test date :	August 01, 2017
Tested By :	Loren Luo

### Requirement(s):

Spec	Item	Requirement	Applicable																
47CFR§15. 247(d), RSS210	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>0.009~0.490</td> <td>2400/F(KHz)</td> </tr> <tr> <td>0.490~1.705</td> <td>24000/F(KHz)</td> </tr> <tr> <td>1.705~30.0</td> <td>30</td> </tr> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216~960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table>	Frequency range (MHz)	Field Strength (µV/m)	0.009~0.490	2400/F(KHz)	0.490~1.705	24000/F(KHz)	1.705~30.0	30	30 – 88	100	88 – 216	150	216~960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (µV/m)																		
0.009~0.490	2400/F(KHz)																		
0.490~1.705	24000/F(KHz)																		
1.705~30.0	30																		
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)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>																

<b>Test Setup</b>	 <p>The diagram shows the test setup. An EUT (Equipment Under Test) is placed on a turntable, which is positioned on a ground plane. A loop antenna is positioned 3 meters away from the EUT. An RF test receiver is connected to the loop antenna. The EUT is mounted on a support unit, and the height of the EUT is 0.8m.</p>  <p>The diagram shows the turn table setup. The EUT and support units are mounted on a turn table, which is positioned on a ground plane. The turn table is 0.8/1.5m high. An antenna tower is positioned 3m away from the EUT. The antenna height is variable, ranging from 1m to 4m. A test receiver is connected to the antenna tower.</p>
<b>Procedure</b>	<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 Quasiy 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.</li> </ol>

	<p>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> <p>5. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p>
Remark	Different RF configuration has been evaluated but not much difference was found. The data presented here is the worst case data with EUT under 802.11n – HT20-2437MHz mode.
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data  Yes  N/A

Test Plot  Yes (See below)  N/A

## Test Result:

Test Mode:	Transmitting Mode
------------	-------------------

Frequency range: 9KHz - 30MHz

Freq. (MHz)	Detection value	Factor (dB/m)	Reading (dBuV/m)	Result (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)
--	--	--	--	--	--	>20
--	--	--	--	--	--	>20

Note:

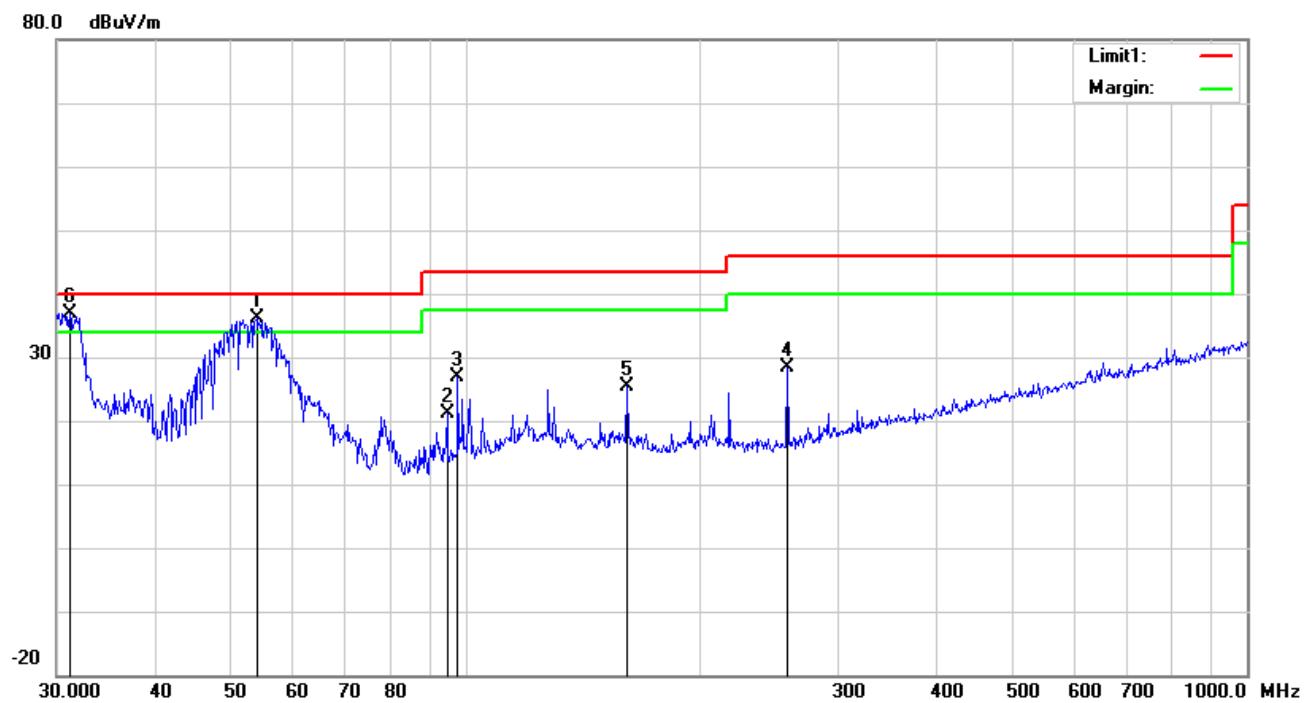
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

**Test Mode:** Transmitting Mode

**30MHz -1GHz**

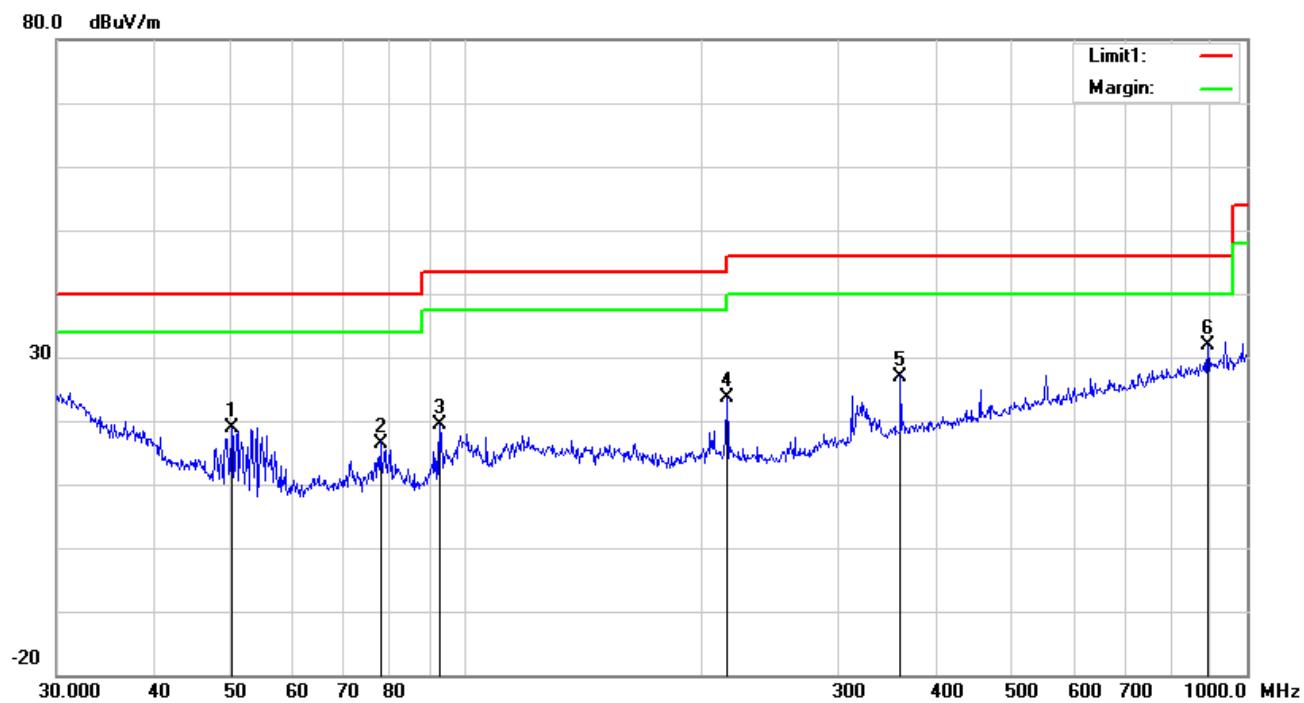


**Test Data**

**Vertical Polarity Plot @3m**

No.	P/L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m)		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	H	54.0711	49.69	QP	7.95	22.39	0.78	36.03	40.00	-3.97	100	230
2	H	94.7601	33.41	peak	9.14	22.32	0.99	21.22	43.50	-22.28	100	278
3	H	97.7983	38.31	peak	9.87	22.32	1.06	26.92	43.50	-16.58	100	151
4	H	258.3264	37.23	peak	11.77	22.29	1.71	28.42	46.00	-17.58	200	323
5	H	160.9089	33.69	peak	12.53	22.27	1.39	25.34	43.50	-18.16	100	343
6	H	31.1798	38.04	QP	20.49	22.27	0.65	36.91	40.00	-3.09	100	288

## 30MHz -1GHz



### Test Data

#### Horizontal Polarity Plot @3m

N o.	P/ L	Frequency	Reading	Detect or	Ant_F	PA_G	Cab_L	Result	Limit	Margin	Height	Degr ee
		(MHz)	(dBuV/m )		(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	( )
1	V	50.2325	32.16	peak	8.37	22.38	0.80	18.95	40.00	-21.05	100	37
2	V	77.8654	30.26	peak	7.64	22.41	1.01	16.50	40.00	-23.50	100	225
3	V	92.7872	32.09	peak	8.67	22.32	0.97	19.41	43.50	-24.09	100	136
4	V	216.0240	32.42	peak	11.88	22.35	1.59	23.54	46.00	-22.46	200	254
5	V	360.4477	32.22	peak	14.87	22.12	2.03	27.00	46.00	-19.00	100	158
6	V	890.7278	27.36	peak	22.40	20.91	3.03	31.88	46.00	-14.12	100	124

### Above 1GHz

Test Mode:	Transmitting Mode
------------	-------------------

#### Low Channel (2422 MHz) (n40 mode worst case)

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)
4844	42.33	AV	V	33.39	7.22	48.46	34.48	54	-19.52
4844	41.85	AV	H	33.39	7.22	48.46	34	54	-20
4844	56.79	PK	V	33.39	7.22	48.46	48.94	74	-25.06
4844	55.21	PK	H	33.39	7.22	48.46	47.36	74	-26.64
5986	26.58	AV	V	34.81	7.21	48.35	20.25	54	-33.75
5986	24.97	AV	H	34.81	7.21	48.35	18.64	54	-35.36
5986	48.73	PK	V	34.81	7.21	48.35	42.4	74	-31.6
5986	46.59	PK	H	34.81	7.21	48.35	40.26	74	-33.74

#### Middle Channel (2437 MHz) (n20 mode worst case)

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	44.12	AV	V	33.62	7.53	48.36	36.91	54	-17.09
4874	43.64	AV	H	33.62	7.53	48.36	36.43	54	-17.57
4874	54.87	PK	V	33.62	7.53	48.36	47.66	74	-26.34
4874	53.14	PK	H	33.62	7.53	48.36	45.93	74	-28.07
14028	25.98	AV	V	40.34	12.82	46.37	32.77	54	-21.23
14028	23.4	AV	H	40.34	12.82	46.37	30.19	54	-23.81
14028	45.19	PK	V	40.34	12.82	46.37	51.98	74	-22.02
14028	44.82	PK	H	40.34	12.82	46.37	51.61	74	-22.39

**High Channel (2462 MHz) (n20 mode worst case)**

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	43.17	AV	V	33.74	7.78	48.34	36.35	54	-17.65
4924	41.62	AV	H	33.74	7.78	48.34	34.8	54	-19.2
4924	54.28	PK	V	33.74	7.78	48.34	47.46	74	-26.54
4924	53.16	PK	H	33.74	7.78	48.34	46.34	74	-27.66
17952	23.05	AV	V	43.21	19.42	44.3	41.38	54	-12.62
17952	22.45	AV	H	43.21	19.42	44.3	40.78	54	-13.22
17952	46.17	PK	V	43.21	19.42	44.3	64.5	74	-9.5
17952	44.28	PK	H	43.21	19.42	44.3	62.61	74	-11.39

**Note:**

- 1, The testing has been conformed to  $10 \times 2462\text{MHz} = 24,620\text{MHz}$
- 2, All other emissions more than 30 dB below the limit
- 3, X-Axis, Y-Axis and Z-Axis were investigated. The results above show only the worst case.
- 4, The radiated spurious test above 18GHz is subcontracted to SIEMIC (Nanjing-China) Laboratories. and found 30dB below the limit at least.

## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>
ISN	ISN T800	34373	09/24/2016	09/23/2017	<input type="checkbox"/>
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/16/2016	09/15/2017	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/18/2016	11/17/2017	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
Horn Antenna	BBHA9170	3145226D1	09/28/2016	09/27/2017	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/23/2017	03/22/2018	<input checked="" type="checkbox"/>
Active Antenna (9kHz-30MHz)	AL-130	121031	10/13/2016	10/12/2017	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/20/2016	09/19/2017	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/24/2016	09/23/2017	<input checked="" type="checkbox"/>

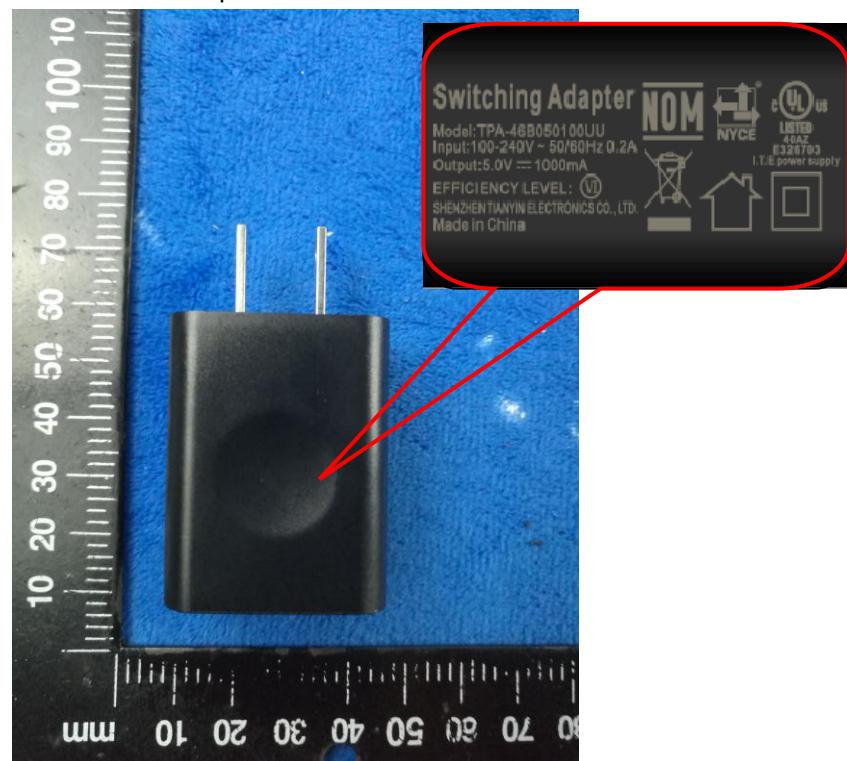
## Annex B. EUT and Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo

Whole Package View



Adapter - Label View



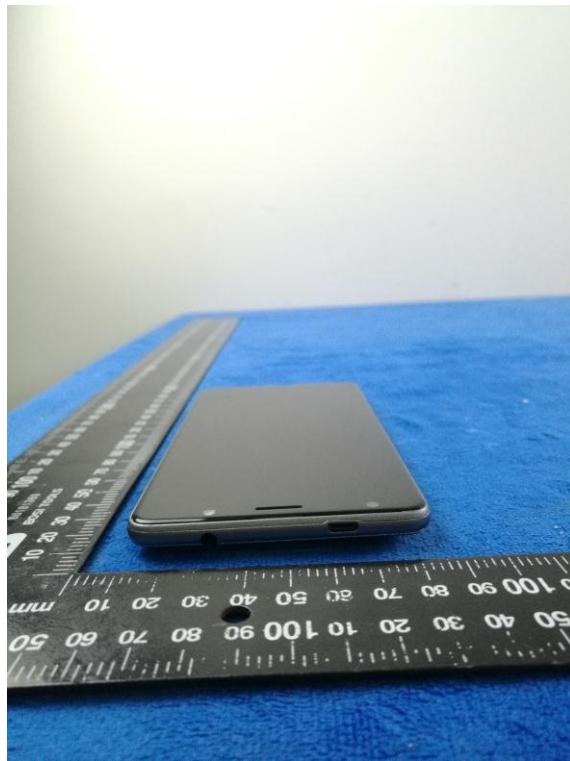
EUT - Front View



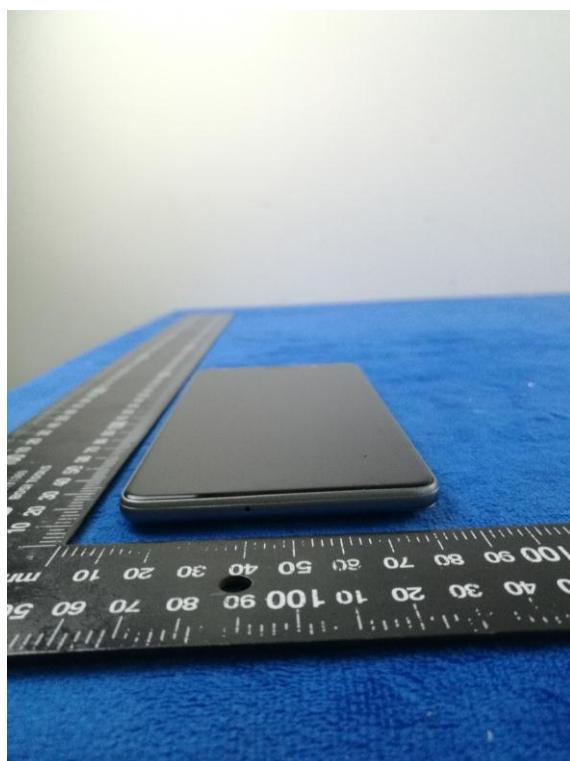
EUT - Rear View



EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View



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

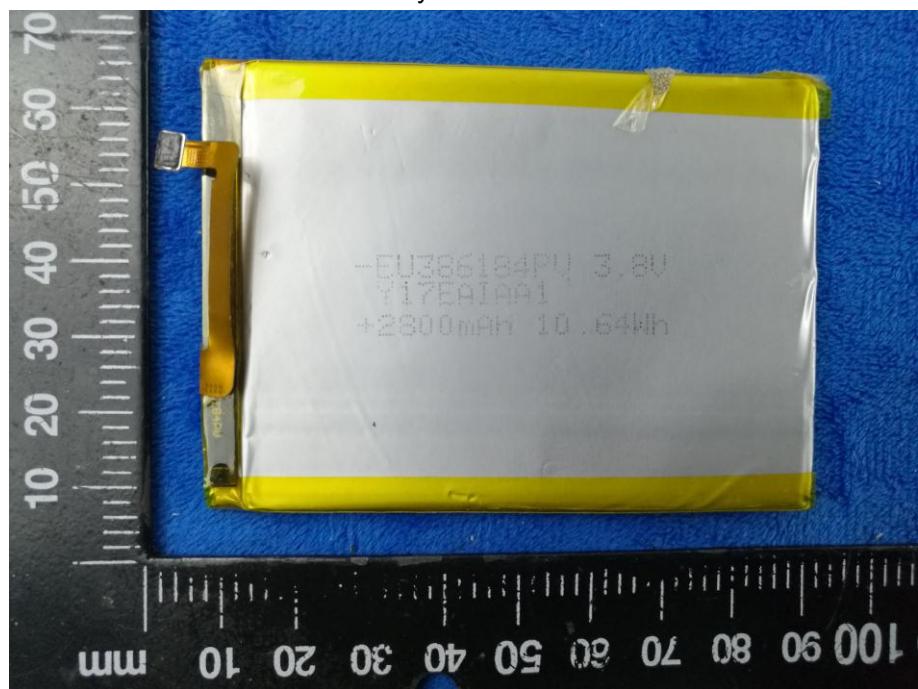
Cover Off - Top View 1



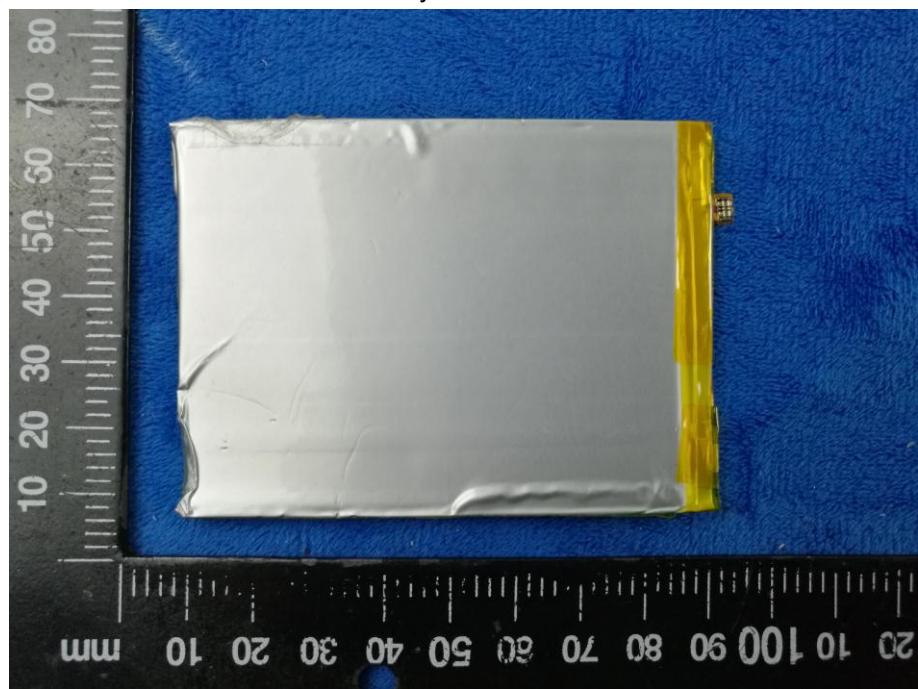
Cover Off - Top View 2



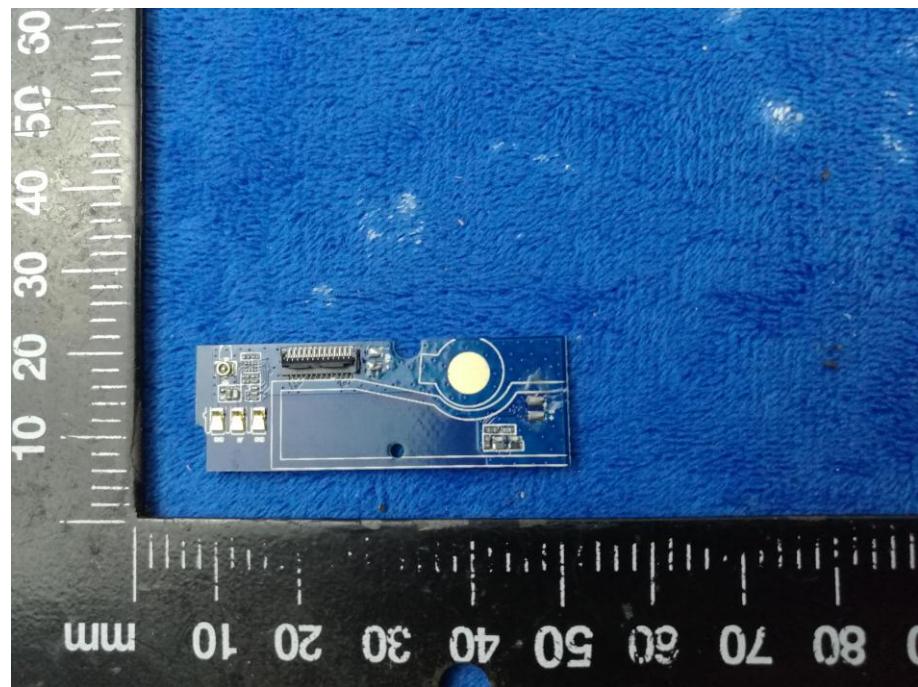
Battery - Front View



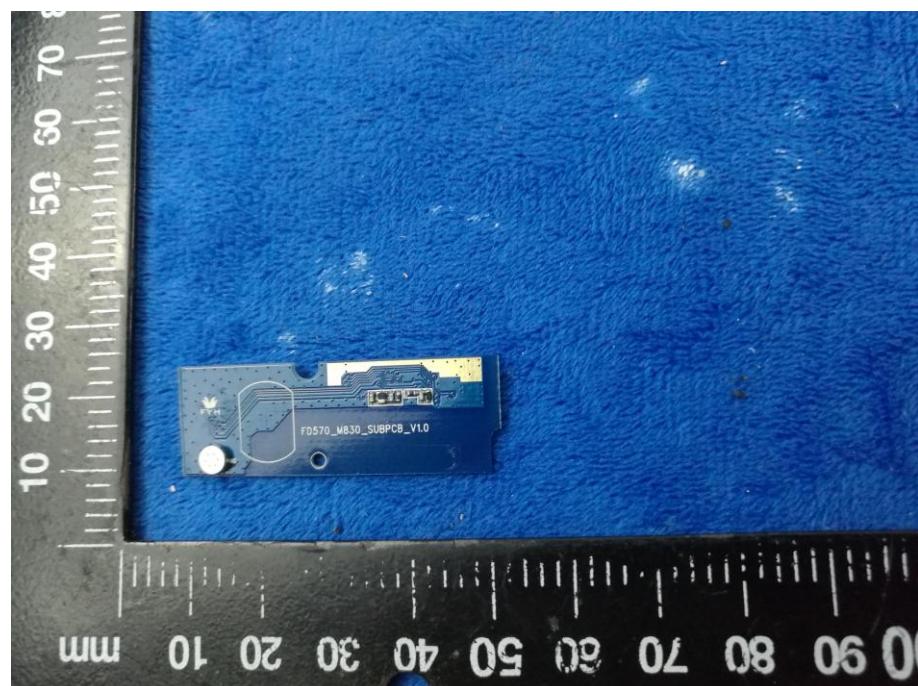
Battery - Rear View



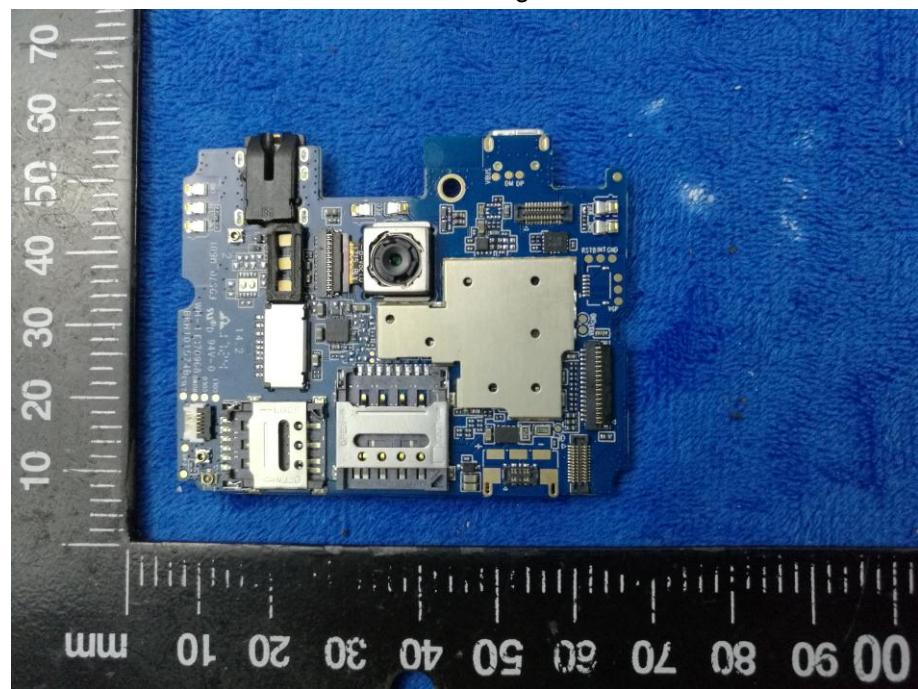
Small Mainboard - Front View



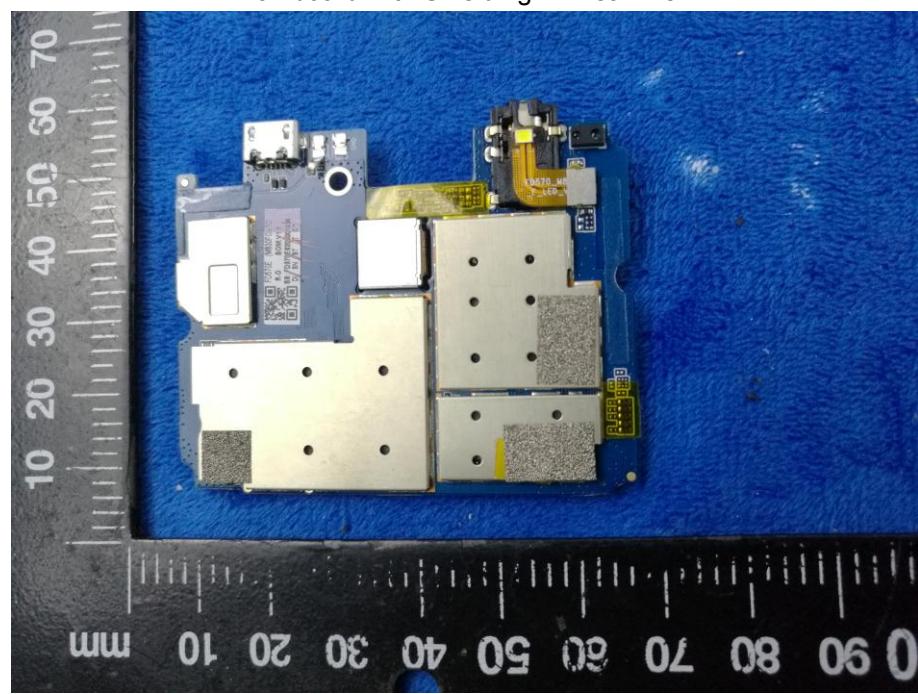
Small Mainboard - Rear View



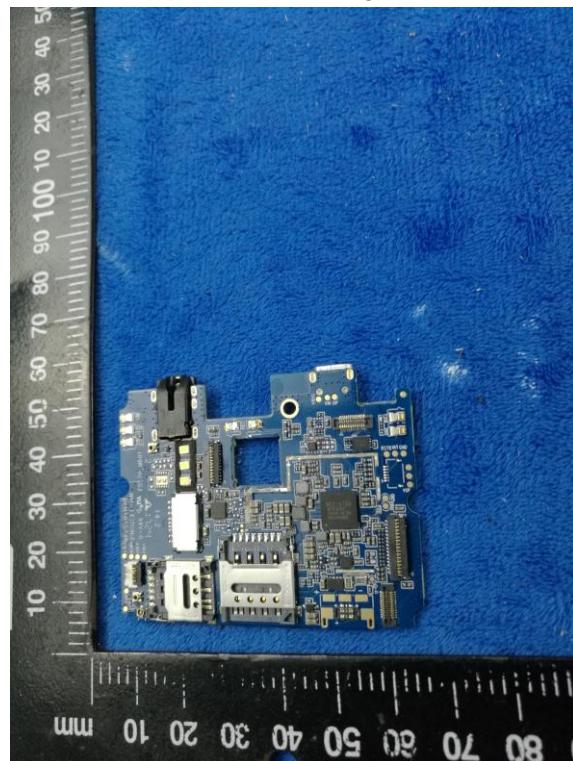
Mainboard with Shielding – Front View



Mainboard with Shielding – Rear View



## Mainboard without Shielding – Front View



### Mainboard without Shielding – Rear View



LCD – Front View



LCD – Rear View



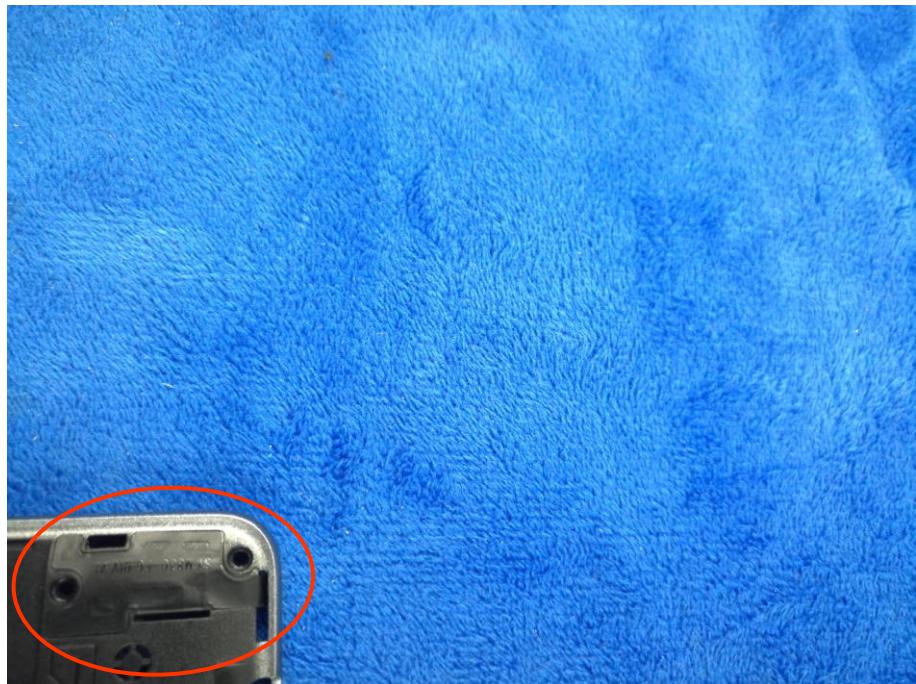
GSM/PCS/UMTS-FDD - Antenna View



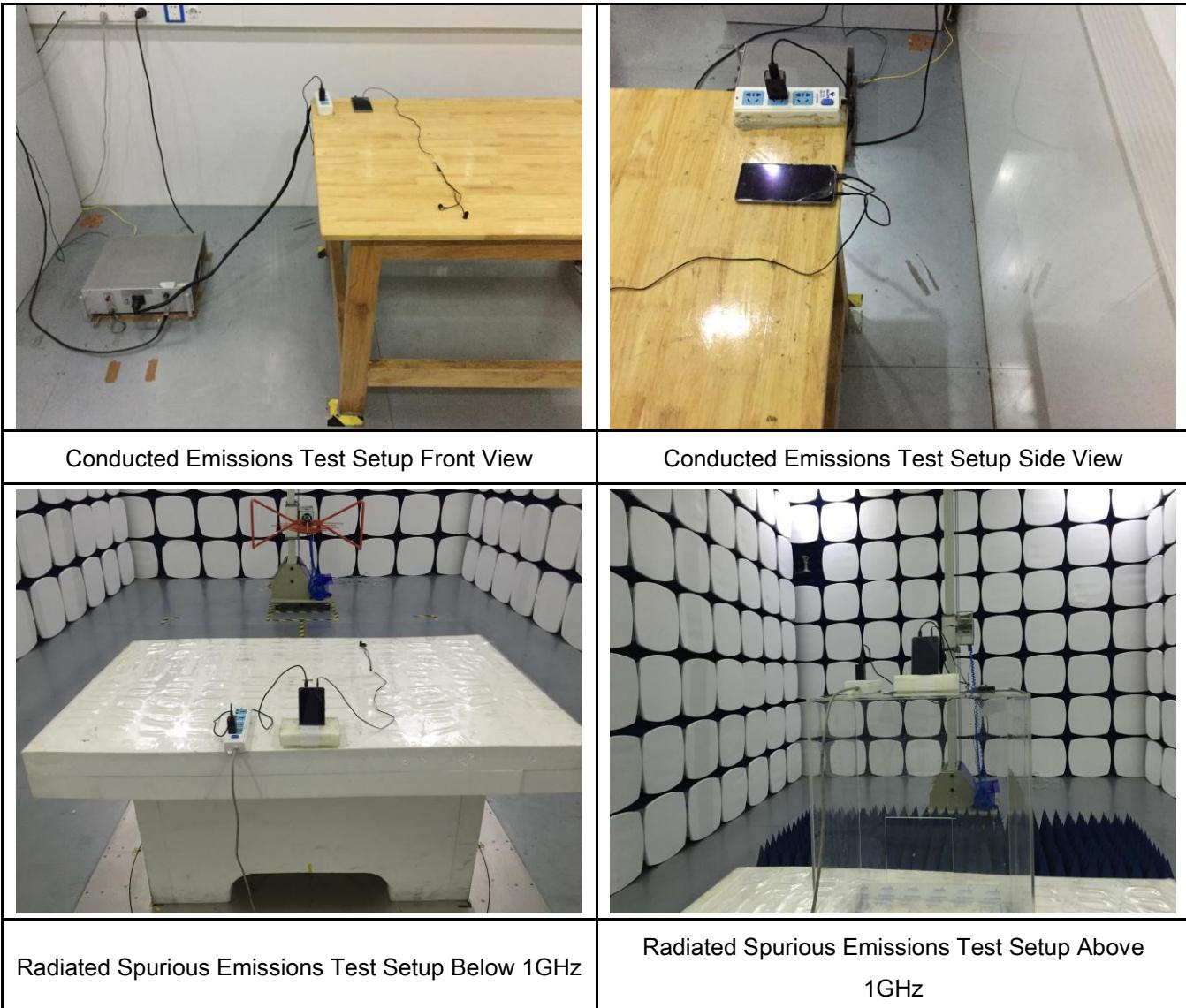
WIFI/BT/BLE/GPS - Antenna View



LTE - Antenna View



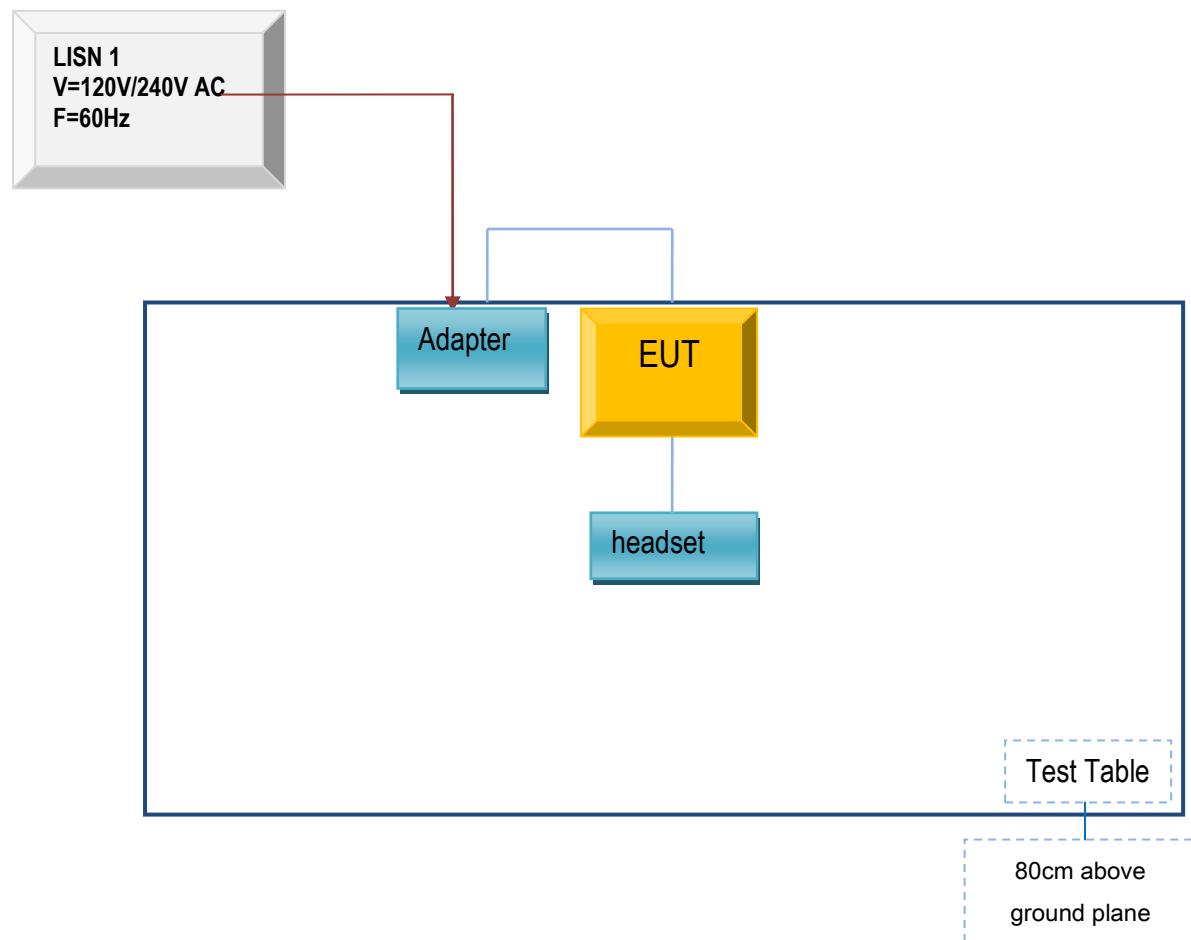
**Annex B.iii. Photograph: Test Setup Photo**



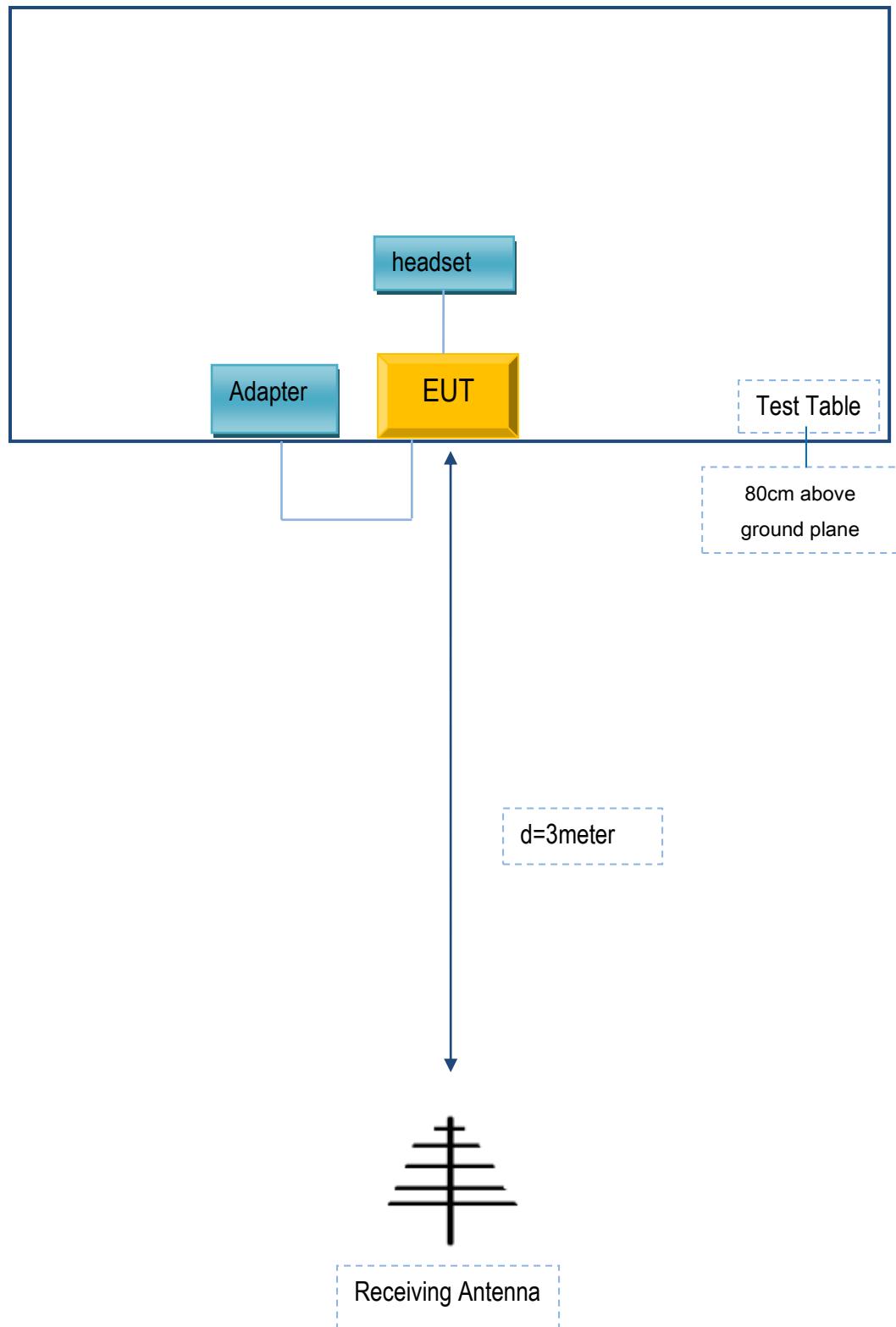
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

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

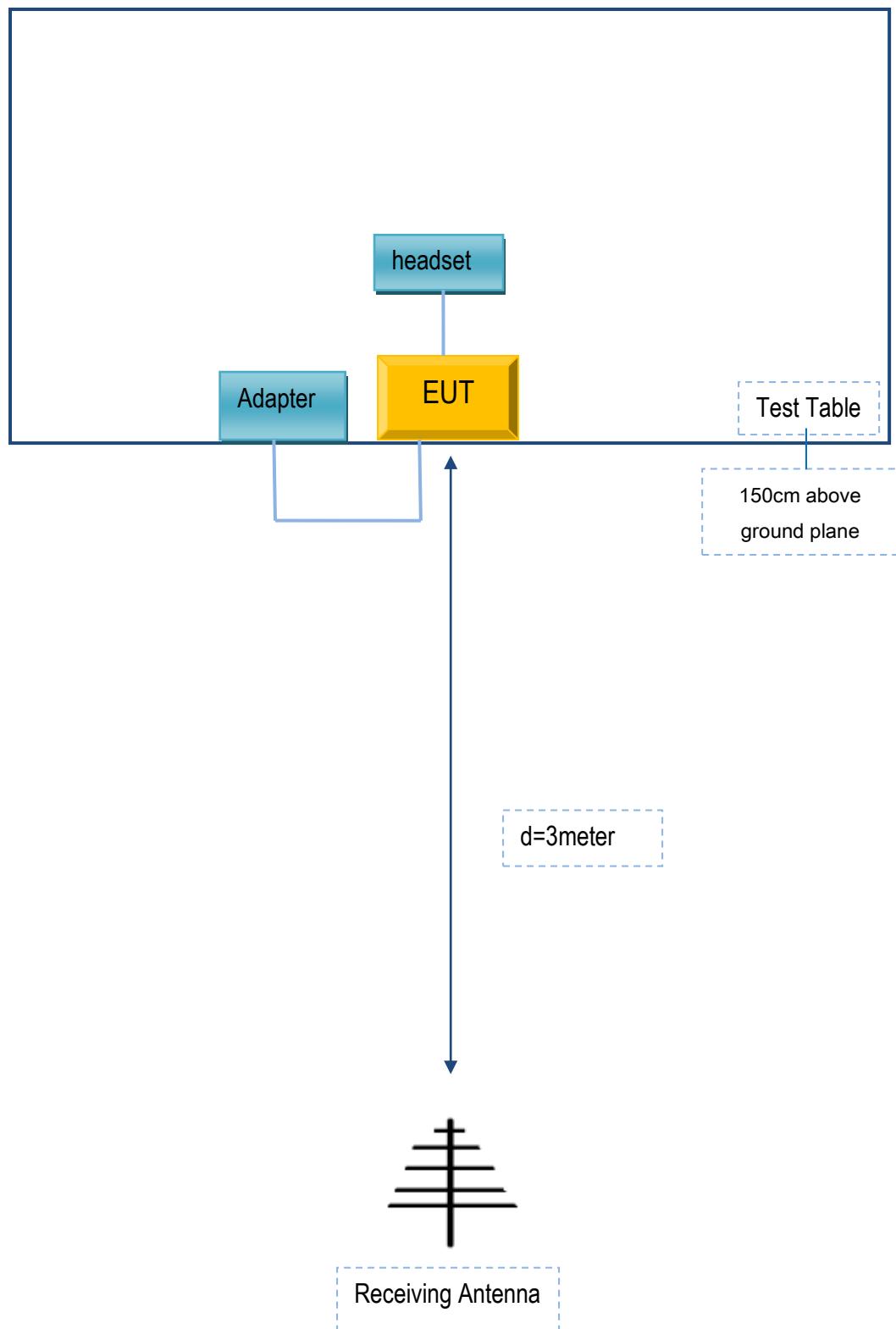
Block Configuration Diagram for AC Line Conducted Emissions



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



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



## Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

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

### Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
Telecell Mobile (H.K) Ltd.	Adapter	TPA-46B050100UU	N/A
Telecell Mobile (H.K) Ltd.	headset	atrium II F55L2	N/A

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
Power Cable	Un-shielding	No	0.8m	N/A

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

Please see the attachment

## Annex E. DECLARATION OF SIMILARITY

N/A