

RF TEST REPORT



Report No.: 17070437-FCC-R4-V1

Supersede Report No.: N/A

Applicant	BLU Products , Inc	
Product Name	Mobile phone	
Model No.	Studio PRO	
Serial No.	N/A	
Test Standard	FCC Part 15.247: 2016, ANSI C63.10: 2013	
Test Date	June 14 to July 02, 2017	
Issue Date	July 19, 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

Zone A, Floor 1, Building 2 Wan Ye Long Technology Park

South Side of Zhoushi Road, Bao'an District, Shenzhen, Guangdong China 518108

Phone: +86 0755 2601 4629801 Email: China@siemic.com.cn

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



Test Report No.	17070437-FCC-R4-V1
Page	3 of 61

This page has been left blank intentionally.

CONTENTS

1. REPORT REVISION HISTORY	5
2. CUSTOMER INFORMATION.....	5
3. TEST SITE INFORMATION.....	5
4. EQUIPMENT UNDER TEST (EUT) INFORMATION	6
5. TEST SUMMARY	8
6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS.....	9
6.1 ANTENNA REQUIREMENT	9
6.2 DTS (6 DB&20 DB) CHANNEL BANDWIDTH	10
6.3 MAXIMUM OUTPUT POWER.....	16
6.4 POWER SPECTRAL DENSITY	20
6.5 BAND-EDGE & UNWANTED EMISSIONS INTO RESTRICTED FREQUENCY BANDS	24
6.6 AC POWER LINE CONDUCTED EMISSIONS.....	30
6.7 RADIATED SPURIOUS EMISSIONS & RESTRICTED BAND.....	36
ANNEX A. TEST INSTRUMENT.....	43
ANNEX B. EUT AND TEST SETUP PHOTOGRAPHS.....	44
ANNEX C. TEST SETUP AND SUPPORTING EQUIPMENT.....	56
ANNEX D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PARTLIST	60
ANNEX E. DECLARATION OF SIMILARITY	61

1. Report Revision History

Report No.	Report Version	Description	Issue Date
17070437-FCC-R4	NONE	Original	July 03, 2017
17070437-FCC-R4-V1	V1	Changed the EUT Photo	July 19, 2017

2. Customer information

Applicant Name	BLU Products , Inc
Applicant Add	10814 NW 33rd St # 100 Doral, FL 33172
Manufacturer	BLU Products , Inc
Manufacturer Add	10814 NW 33rd St # 100 Doral, FL 33172

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 of Radiated Emission	Radiated Emission Program-To Shenzhen v2.0
Test Software of Conducted Emission	EZ-EMC(ver.lcp-03A1)

4. Equipment under Test (EUT) Information

Description of EUT:	Mobile phone
Main Model:	Studio PRO
Serial Model:	N/A
Date EUT received:	June 13, 2017
Test Date(s):	June 14 to July 02, 2017
Equipment Category :	DTS
Antenna Gain:	GSM850: -1.02dBi PCS1900: -1.2dBi UMTS-FDD Band V: -1.2dBi UMTS-FDD Band IV: -1.03dBi UMTS-FDD Band II: -1.2dBi WIFI: -0.61dBi Bluetooth/BLE: -0.45dBi GPS: -1.2dBi
Antenna Type:	PIFA antenna
Type of Modulation:	GSM / GPRS: GMSK EGPRS: GMSK UMTS-FDD: QPSK 802.11b/g/n: DSSS, OFDM Bluetooth: GFSK, π /4DQPSK, 8DPSK BLE: GFSK GPS:BPSK
RF Operating Frequency (ies):	GSM850 TX: 824.2 ~ 848.8 MHz; RX: 869.2 ~ 893.8 MHz PCS1900 TX: 1850.2 ~ 1909.8 MHz; RX: 1930.2 ~ 1989.8 MHz UMTS-FDD Band V TX: 826.4 ~ 846.6 MHz; RX: 871.4 ~ 891.6 MHz UMTS-FDD Band IV TX:1712.4 ~ 1752.6 MHz; RX : 2112.4 ~ 2152.6 MHz UMTS-FDD Band II TX:1852.4 ~ 1907.6 MHz; RX: 1932.4 ~ 1987.6 MHz

Test Report No.	17070437-FCC-R4-V1
Page	7 of 61

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

802.11b: 10.88 dBm

Max. Output Power: 802.11g: 10.96 dBm

802.11n(20M): 10.87 dBm

802.11n(40M): 11.42 dBm

GSM 850: 124CH

PCS1900: 299CH

UMTS-FDD Band V: 102CH

UMTS-FDD Band IV: 202CH

UMTS-FDD Band II: 277CH

Number of Channels: 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: AC100-240V~50/60Hz,0.2A

Input Power: Output: DC 5.0V,1.0A

Battery:

Model: C745243200L

Spec : 3.8V,2000mAh,7.60Wh

Trade Name : BLU

FCC ID: YHLBLUSTUDIOPRO

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

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 -1.02dBi for GSM, the gain is -1.2dBi for PCS/ UMTS-FDD Band V/II, the gain is -1.03dBi for UMTS-FDD Band IV.

A permanently attached PIFA antenna for Bluetooth/WIFI/BLE/GPS, the gain is -0.45dBi for Bluetooth/BLE, the gain is -0.61dBi for WIFI.

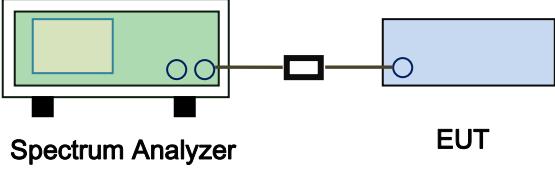
A permanently attached PIFA antenna for GPS, the gain is -1.2dBi for GPS.

The antenna meets up with the ANTENNA REQUIREMENT.

Result: Compliance.

6.2 DTS (6 dB&20 dB) Channel Bandwidth

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	June 27, 2017
Tested By :	Loren Luo

Spec	Item	Requirement	Applicable
§ 15.247(a)(2)	a)	6dB BW \geq 500kHz;	<input checked="" type="checkbox"/>
RSS Gen(4.6.1)	b)	99% BW: For FCC reference only; required by IC.	<input checked="" type="checkbox"/>
Test Setup		 Spectrum Analyzer EUT	
Test Procedure		<p>558074 D01 DTS MEAS Guidance v03r03, 8.1 DTS bandwidth</p> <p><u>6dB bandwidth</u></p> <ol style="list-style-type: none"> Set RBW = 100 kHz. Set the video bandwidth (VBW) $\geq 3 \times$ RBW. Detector = Peak. Trace mode = max hold. Sweep = auto couple. Allow the trace to stabilize. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. <p><u>20dB bandwidth</u></p> <p>C63.10 Occupied Bandwidth (OBW=20dB bandwidth)</p> <ol style="list-style-type: none"> Set RBW = 1%-5% OBW. Set the video bandwidth (VBW) $\geq 3 \times$ RBW. Set the span range between 2 times and 5 times of the OBW. Sweep time=Auto, Detector=PK, Trace=Max hold. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce the worst- 	

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

Test Data Yes N/A

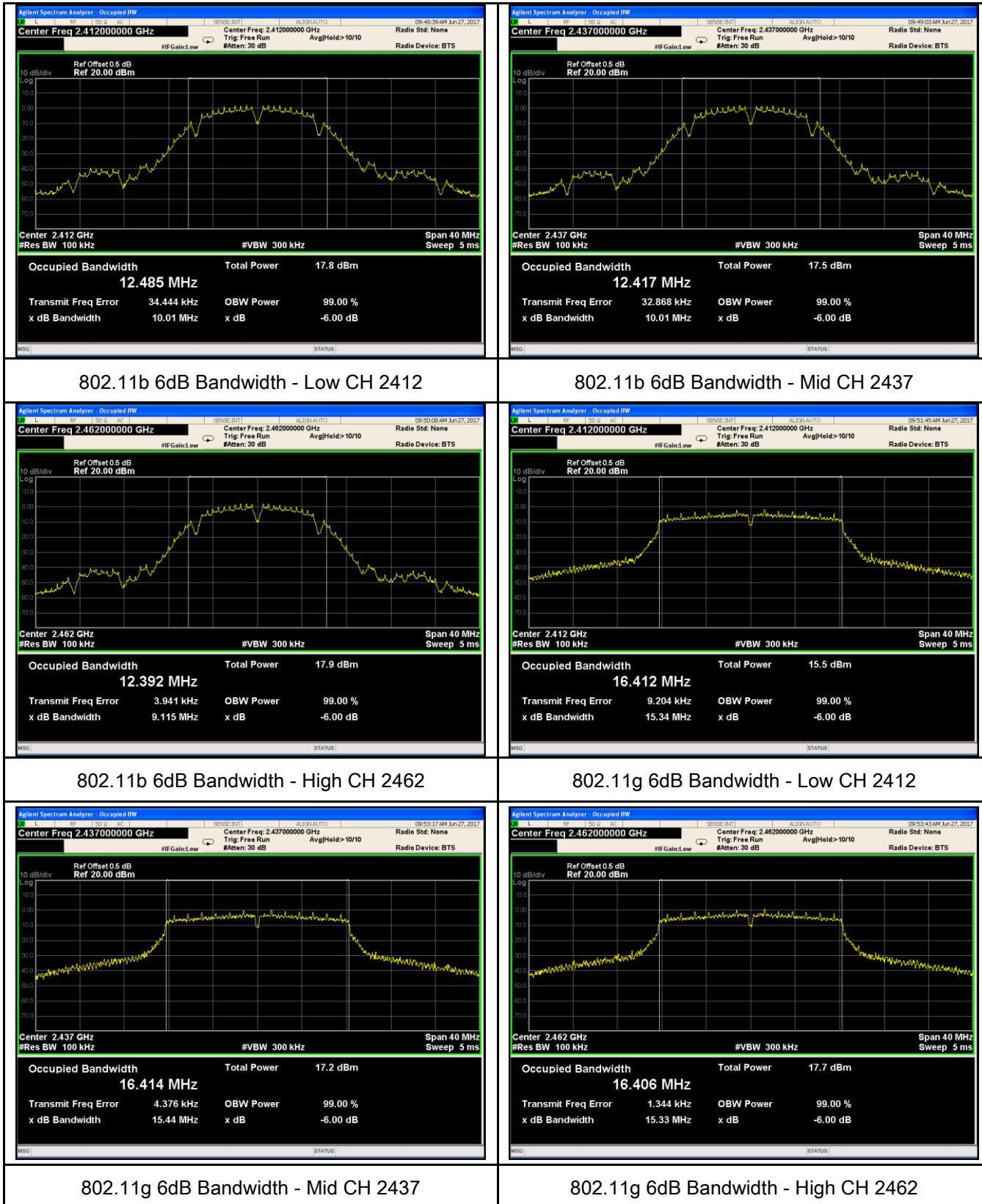
Test Plot Yes (See below) N/A

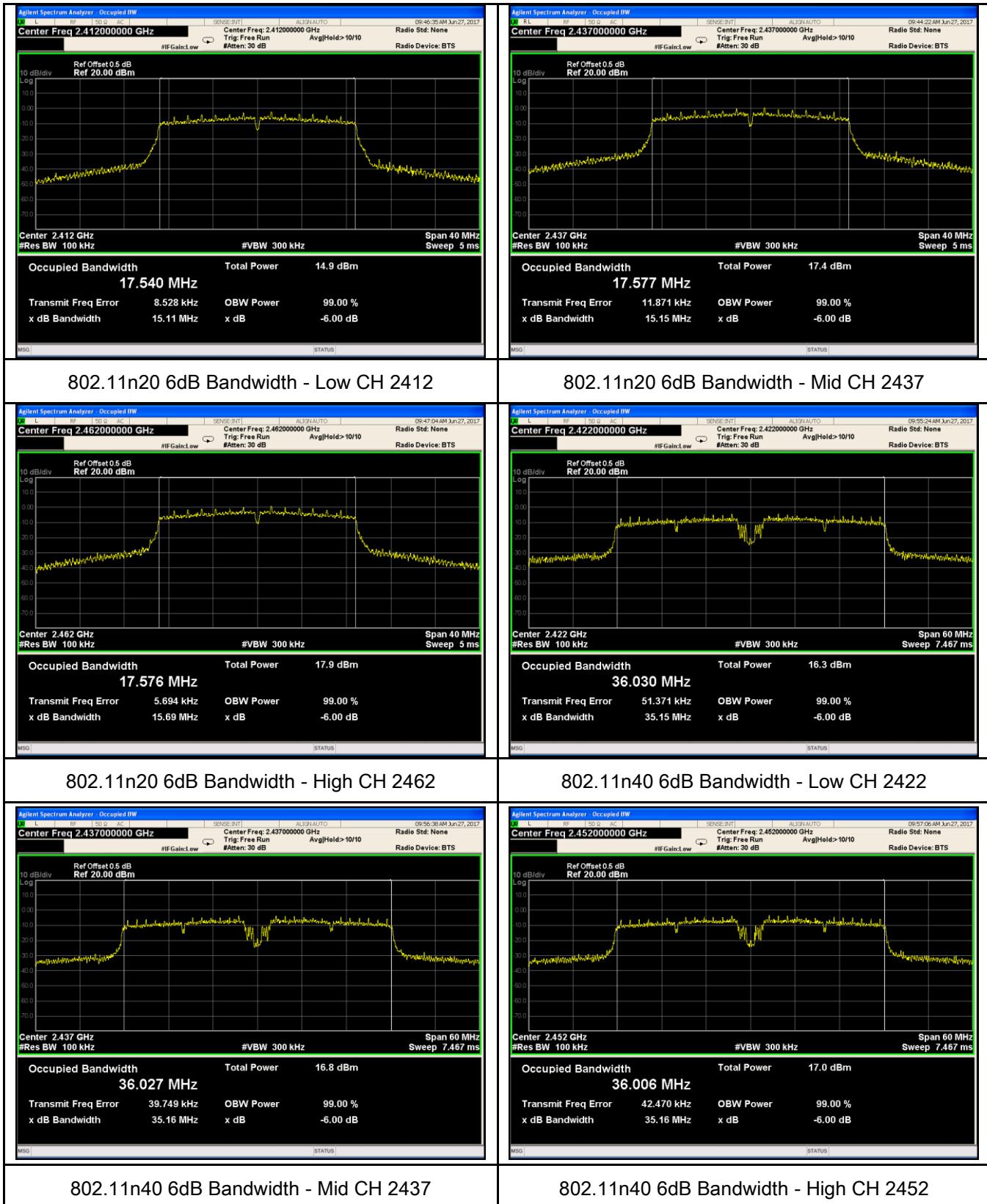
Measurement result

Test mode	CH	Freq (MHz)	6dB Bandwidth (MHz)	20dB Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.01	14.28	≥ 0.5
	Mid	2437	10.01	14.27	≥ 0.5
	High	2462	9.115	14.25	≥ 0.5
802.11g	Low	2412	15.34	18.79	≥ 0.5
	Mid	2437	15.44	18.83	≥ 0.5
	High	2462	15.33	18.71	≥ 0.5
802.11n (20M)	Low	2412	15.11	19.27	≥ 0.5
	Mid	2437	15.15	19.33	≥ 0.5
	High	2462	15.69	19.25	≥ 0.5
802.11n (40M)	Low	2422	35.15	39.58	≥ 0.5
	Mid	2437	35.16	39.32	≥ 0.5
	High	2452	35.16	39.95	≥ 0.5

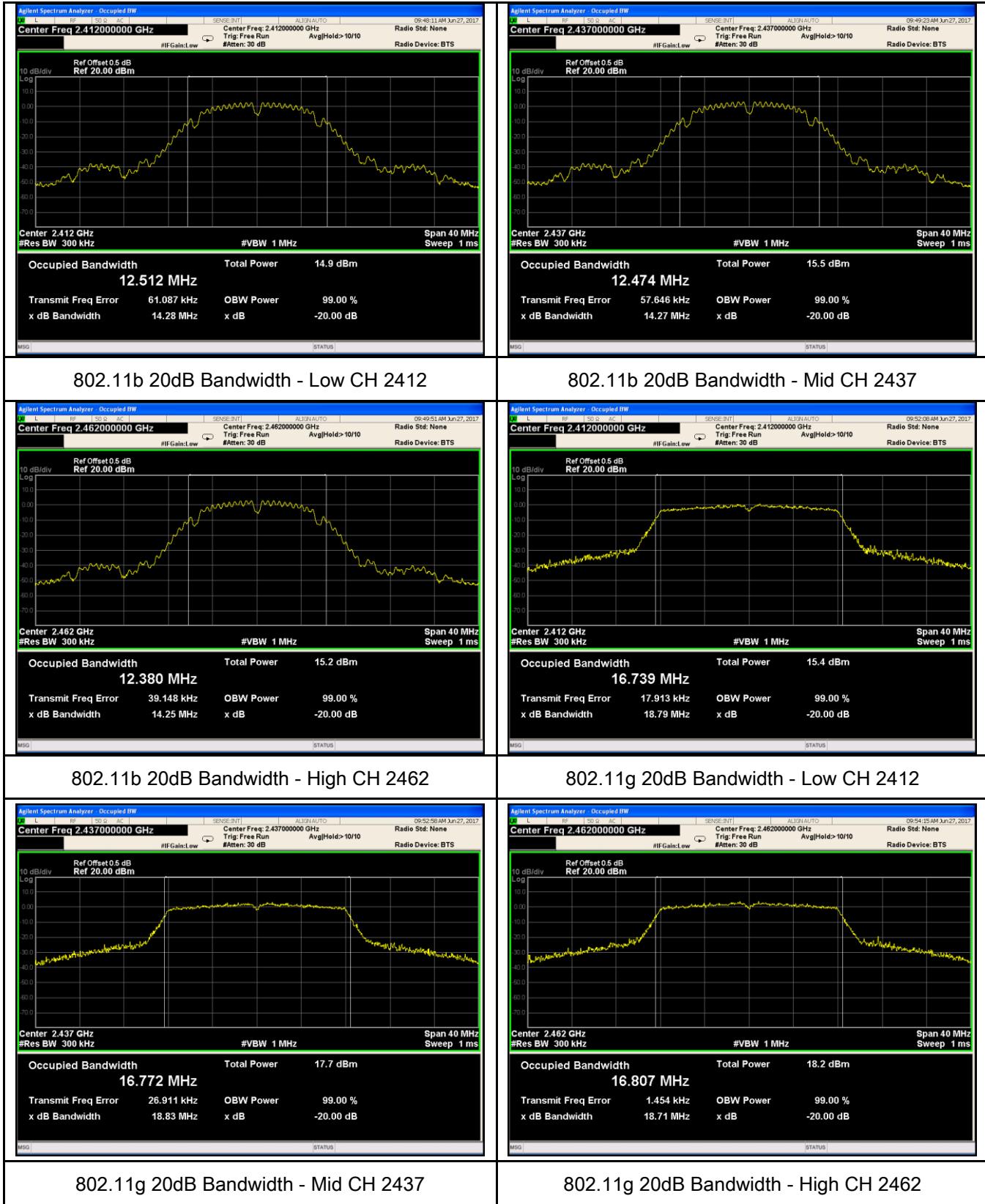
Test Plots

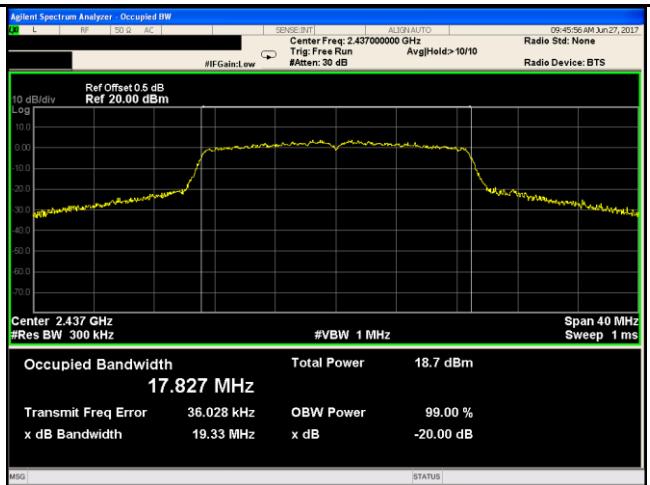
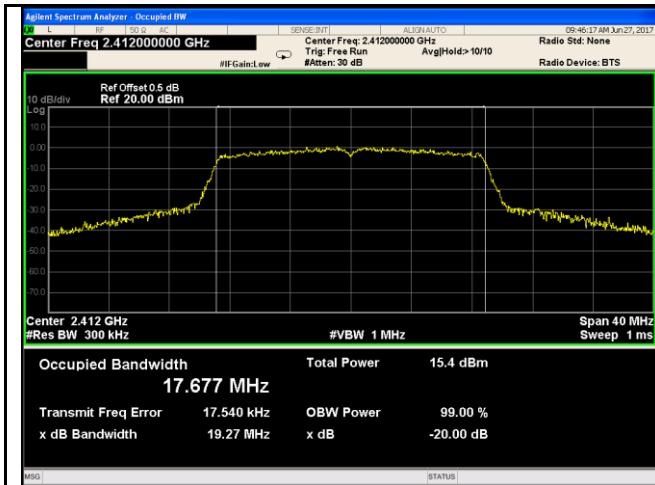
6dB Bandwidth measurement result



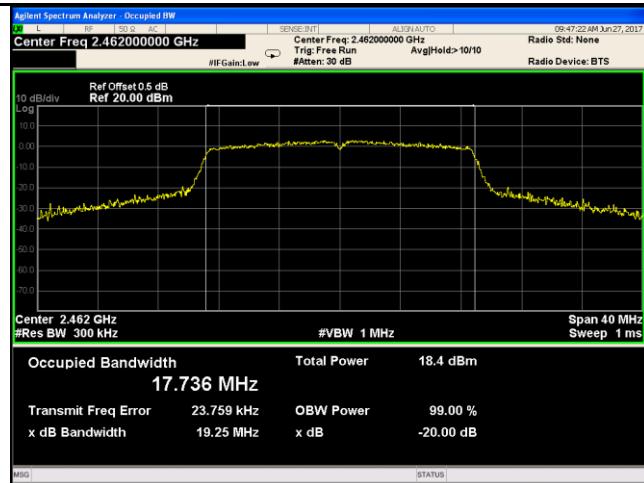


20 dB Bandwidth measurement result

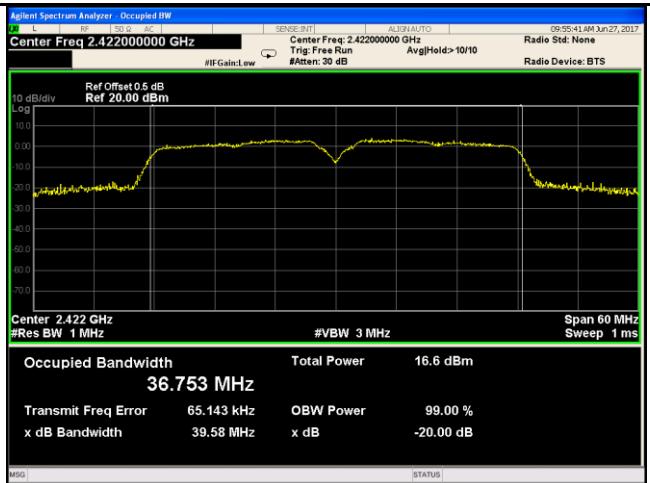




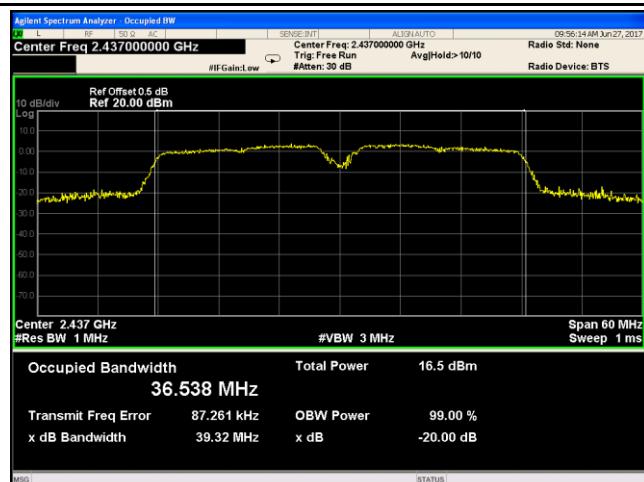
802.11n20 20dB Bandwidth - Low CH 2412



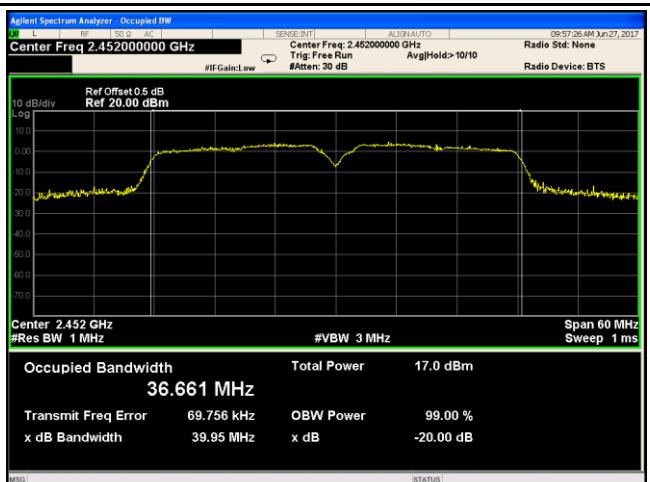
802.11n20 20dB Bandwidth - Mid CH 2437



802.11n20 20dB Bandwidth - High CH 2462



802.11n40 20dB Bandwidth - Low CH 2422



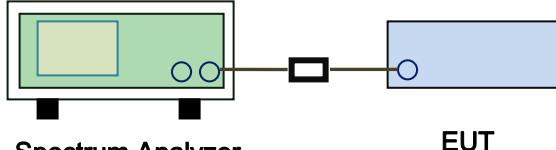
802.11n40 20dB Bandwidth - Mid CH 2437

802.11n40 20dB Bandwidth - High CH 2452

6.3 Maximum Output Power

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	June 27, 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		 <p style="text-align: center;">Spectrum Analyzer EUT</p>	
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"> - a) Set span to at least 1.5 times the OBW. - b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz. - c) Set VBW \geq 3 x RBW. - d) Number of points in sweep \geq 2 \times span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.) - e) Sweep time = auto. - f) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode. - g) If transmit duty cycle $<$ 98 %, use a sweep trigger with the level set to enable triggering only on full power pulses. The transmitter shall operate at maximum 	

	<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 $\geq 98\%$, and if each transmission is entirely at the maximum power control level, then the trigger shall be set to “ free run” .</p> <ul style="list-style-type: none"> - h) Trace average at least 100 traces in power averaging (i.e., RMS) mode. - i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’ s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A

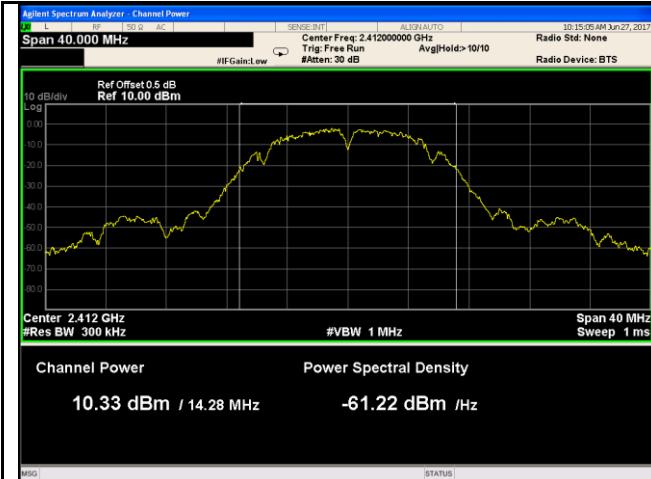
Test Plot Yes (See below) N/A

Output Power measurement result

Type	Test mode	CH	Frequency (MHz)	Conducted Power (dBm)	Limit (dBm)	Result
Output power	802.11b	Low	2412	10.33	30	Pass
		Mid	2437	10.88	30	Pass
		High	2462	10.72	30	Pass
	802.11g	Low	2412	10.38	30	Pass
		Mid	2437	10.96	30	Pass
		High	2462	10.67	30	Pass
	802.11n (20M)	Low	2412	10.30	30	Pass
		Mid	2437	10.87	30	Pass
		High	2462	10.85	30	Pass
	802.11n (40M)	Low	2422	10.99	30	Pass
		Mid	2437	11.01	30	Pass
		High	2452	11.42	30	Pass

Test Plots

The Average Power



802.11b - AV Output power - Low CH 2412

802.11b - AV Output power - Mid CH 2437



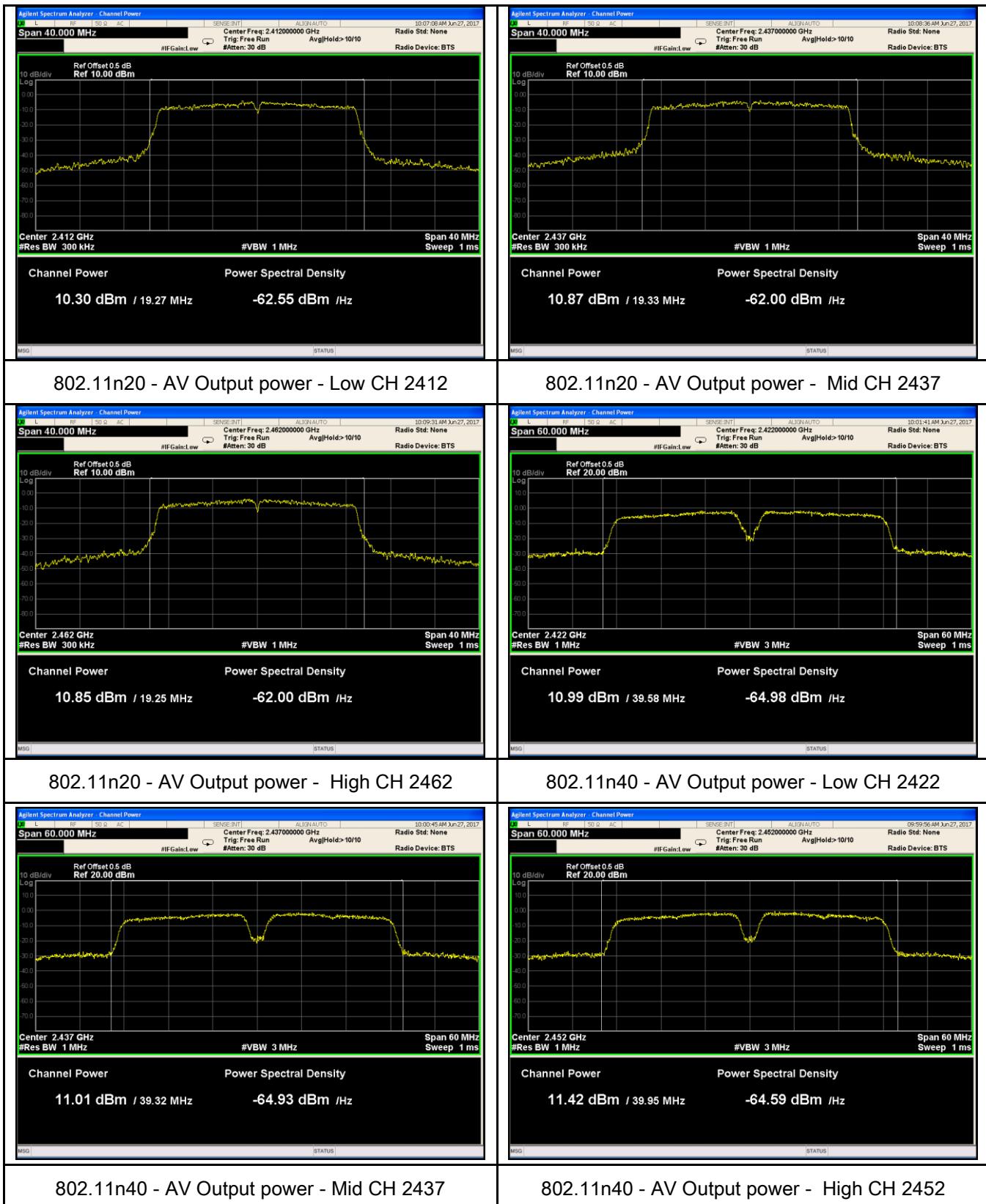
802.11b - AV Output power - High CH 2462

802.11g - AV Output power - Low CH 2412



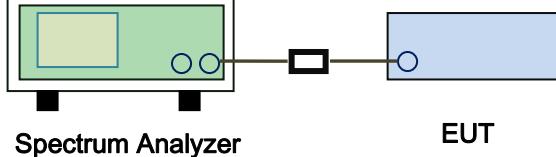
802.11g - AV Output power - Mid CH 2437

802.11g - AV Output power - High CH 2462



6.4 Power Spectral Density

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1023mbar
Test date :	June 27, 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		 <p style="text-align: center;">Spectrum Analyzer EUT</p>	
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"> - a) Set analyzer center frequency to DTS channel center frequency. - b) Set the span to 1.5 times the DTS bandwidth. - c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. - d) Set the VBW $\geq 3 \times \text{RBW}$. - e) Detector = peak. - f) Sweep time = auto couple. - g) Trace mode = max hold. - h) Allow trace to fully stabilize. - i) Use the peak marker function to determine the maximum amplitude level within the RBW. - j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat. 	
Remark			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

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	-12.221	8	Pass
		Mid	2437	-11.450	8	Pass
		High	2462	-11.766	8	Pass
	802.11g	Low	2412	-13.979	8	Pass
		Mid	2437	-13.437	8	Pass
		High	2462	-12.365	8	Pass
	802.11n (20M)	Low	2412	-15.159	8	Pass
		Mid	2437	-13.009	8	Pass
		High	2462	-12.687	8	Pass
	802.11n (40M)	Low	2422	-16.298	8	Pass
		Mid	2437	-16.396	8	Pass
		High	2452	-15.321	8	Pass

Test Plots

Power Spectral Density measurement result



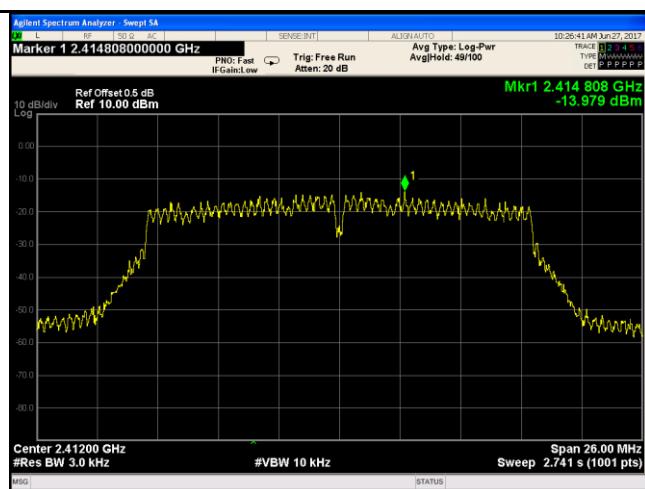
PSD - Low CH 2412 - 802.11b



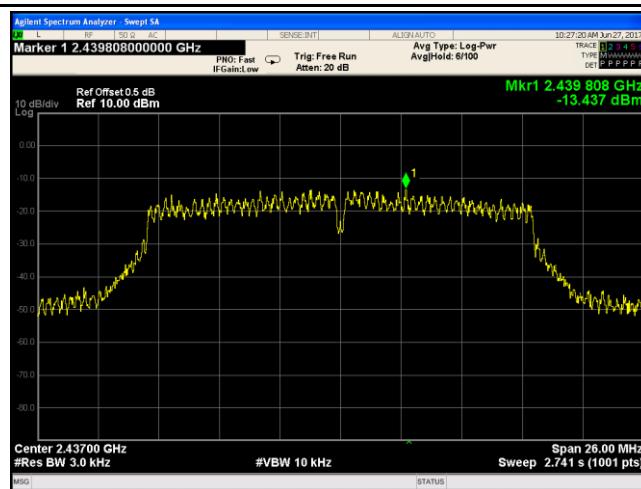
PSD - Mid CH 2437 – 802.11b



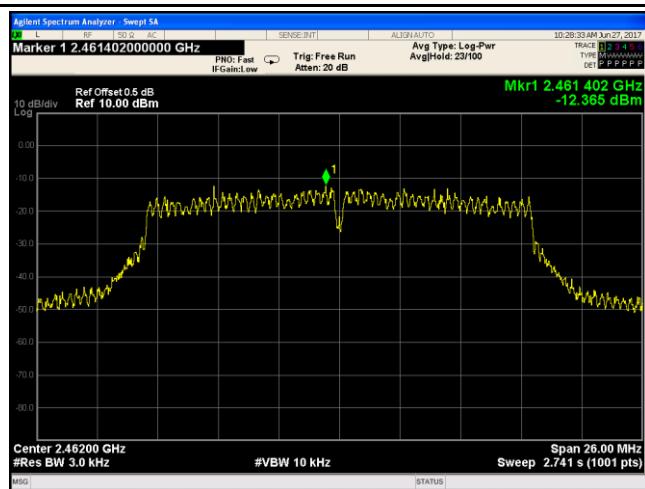
PSD - High CH 2462 - 802.11b



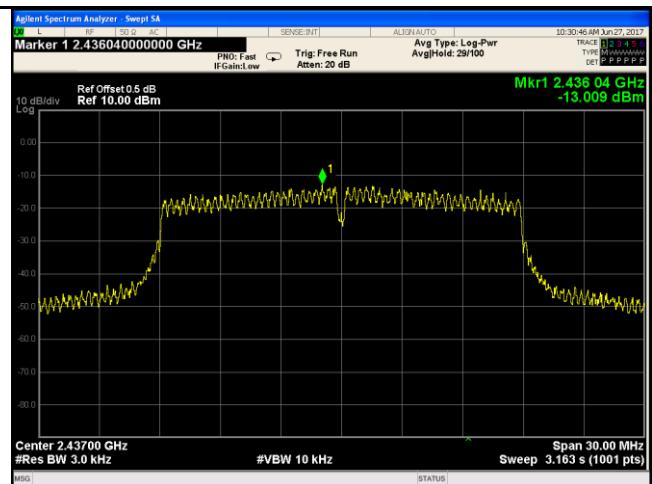
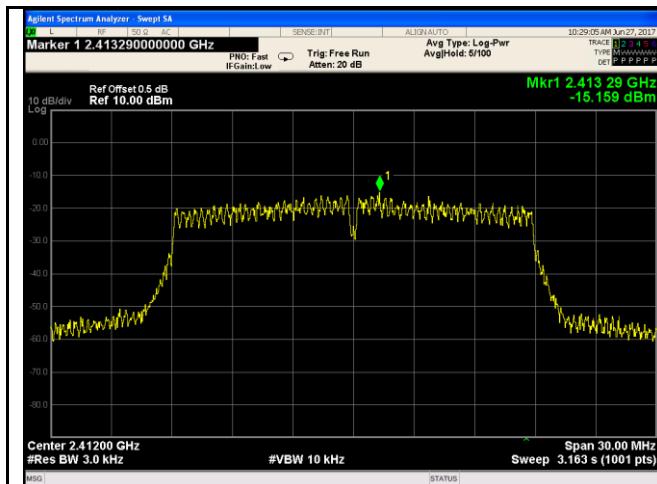
PSD - Low CH 2412 - 802.11g



PSD - Mid CH 2437 – 802.11g

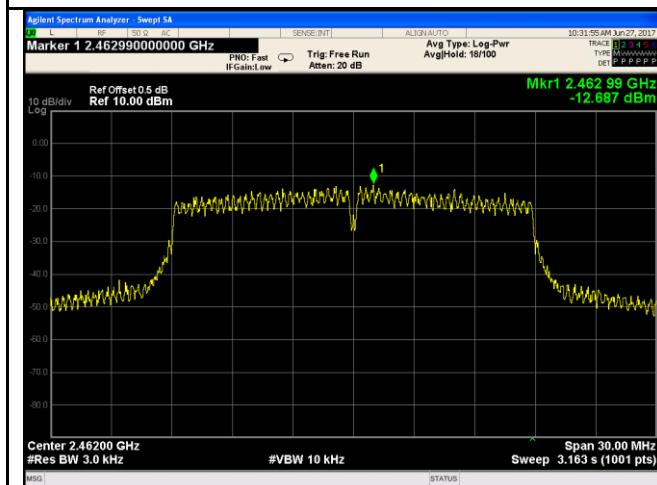


PSD - High CH 2462 - 802.11g



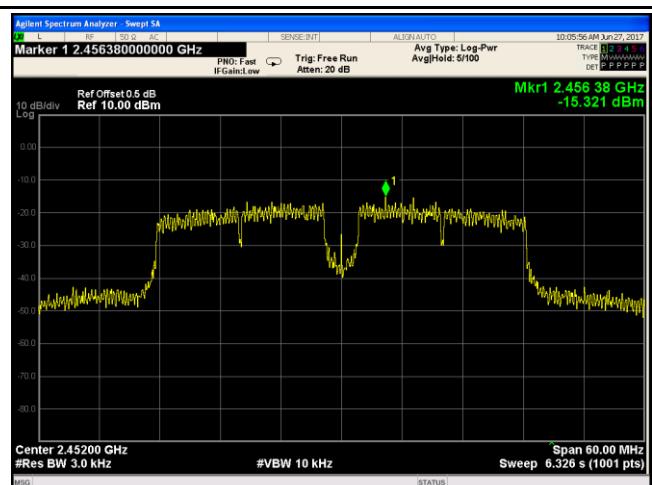
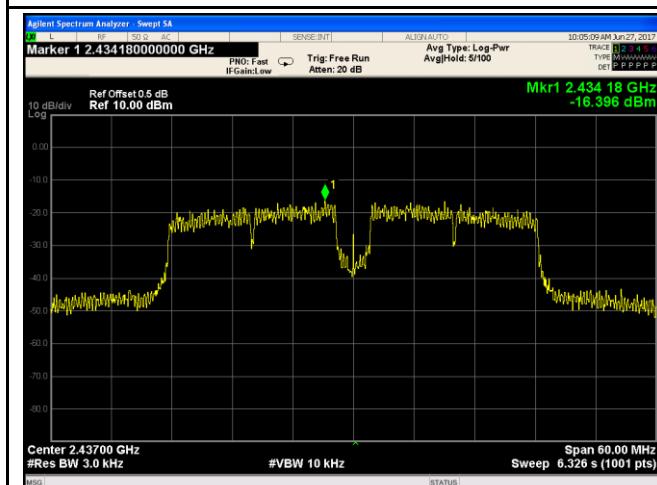
PSD - Low CH 2412 - 802.11n20

PSD - Mid CH 2437 – 802.11n20



PSD - High CH 2472 - 802.11n20

PSD - Low CH 2422 - 802.11n40



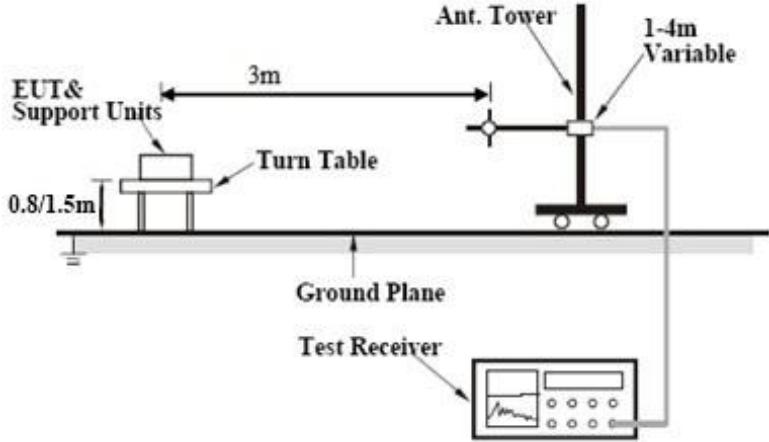
PSD - Mid CH 2437 – 802.11n40

PSD - High CH 2452 - 802.11n40

6.5 Band-Edge & Unwanted Emissions into Restricted Frequency Bands

Temperature	25 °C
Relative Humidity	57%
Atmospheric Pressure	1018mbar
Test date :	June 19, 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			
Test Procedure	<p>Radiated Method Only</p> <ul style="list-style-type: none"> - 1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator. - 2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range. 		

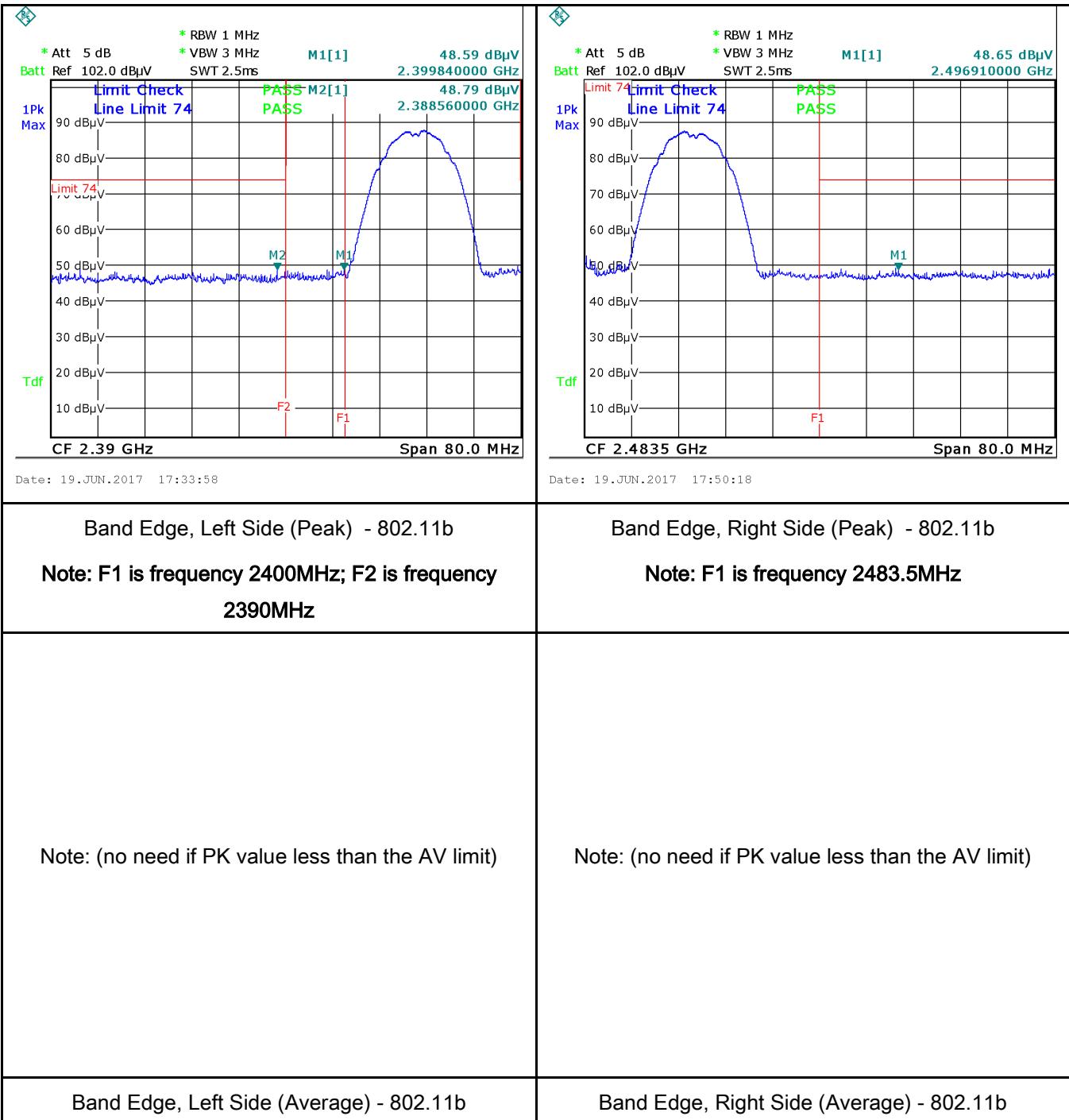
	<ul style="list-style-type: none"> - 3. First, set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, check the emission of EUT, if pass then set Spectrum Analyzer as below: <ul style="list-style-type: none"> a. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 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. 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. - 4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - 5. Repeat above procedures until all measured frequencies were complete.
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

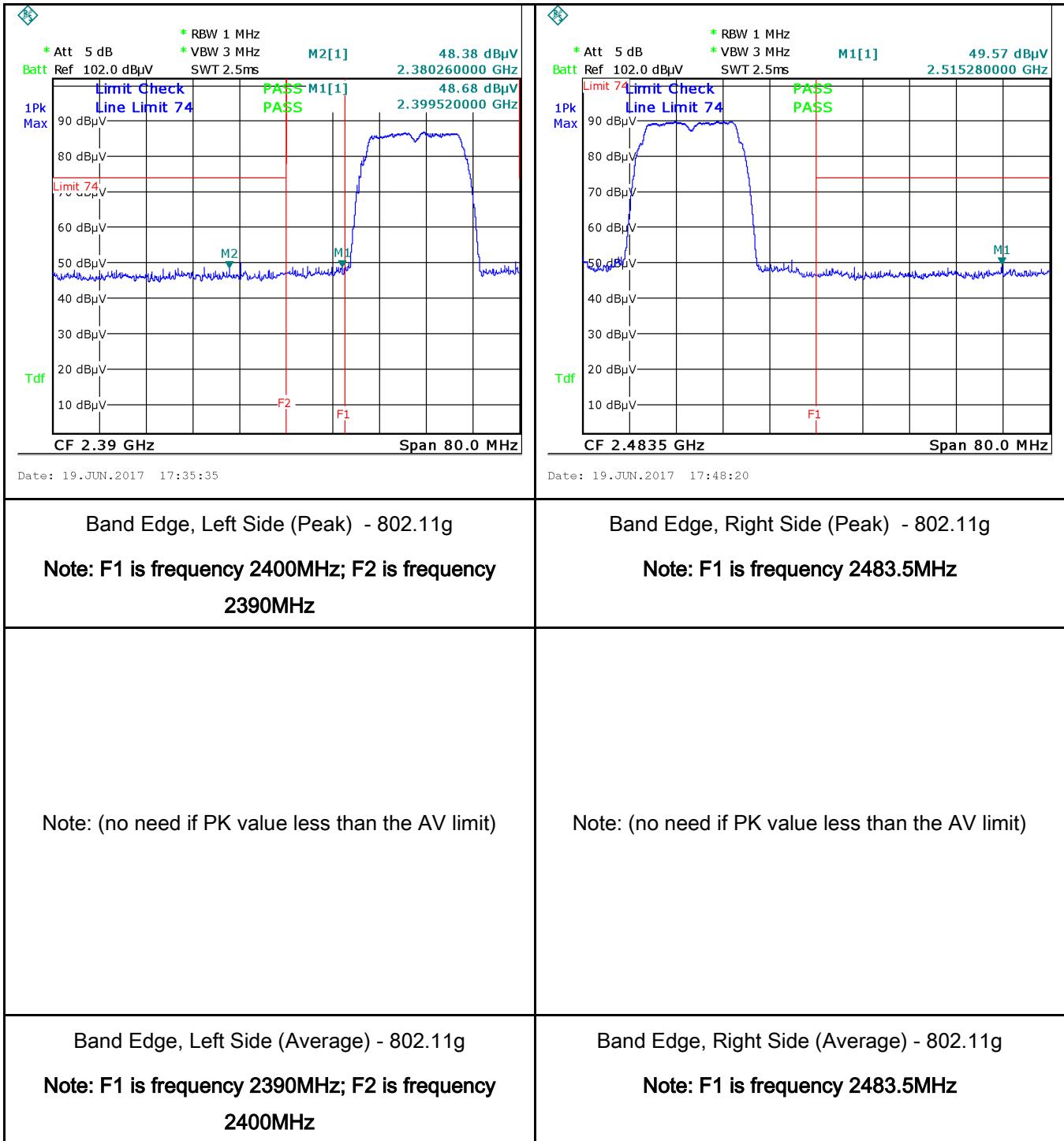
Test Data Yes N/A

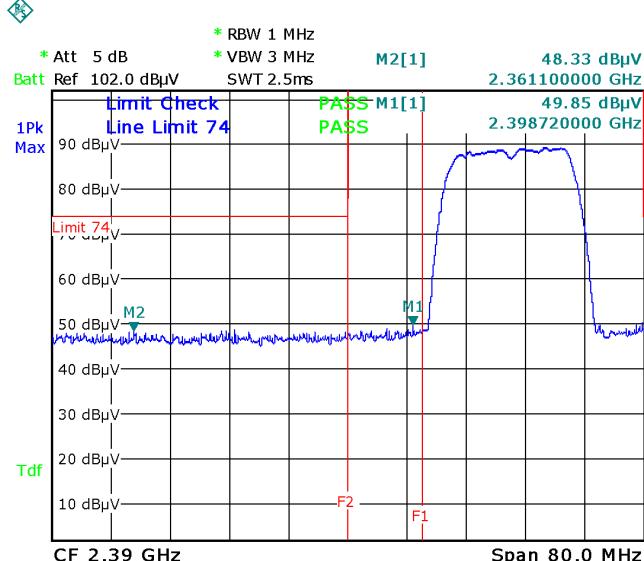
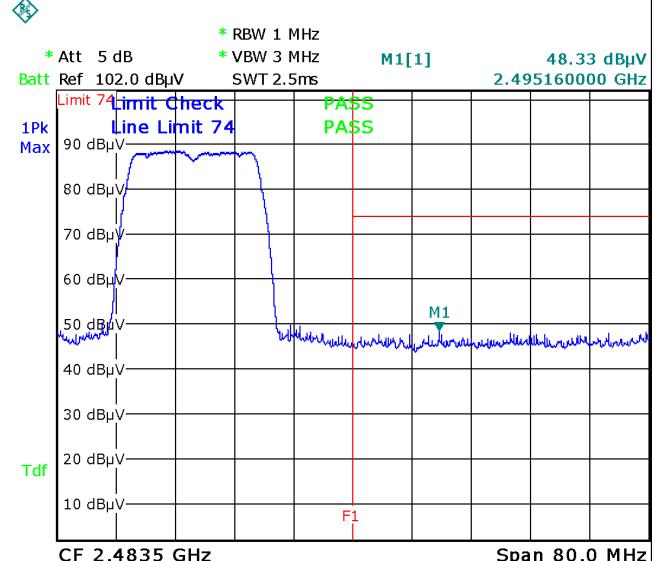
Test Plot Yes (See below) N/A

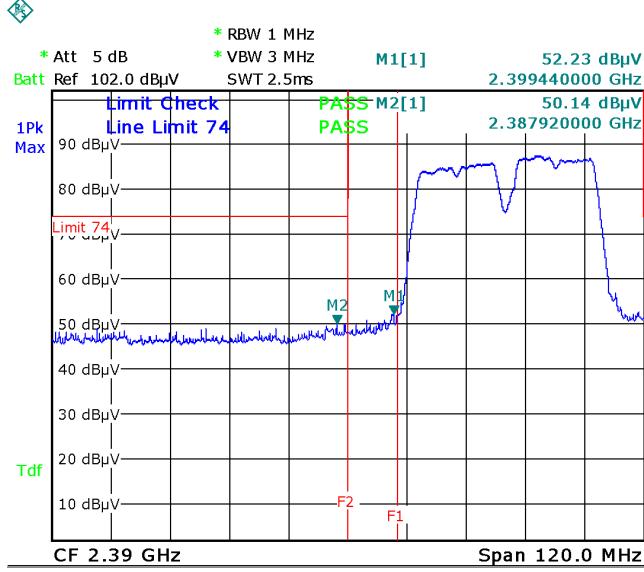
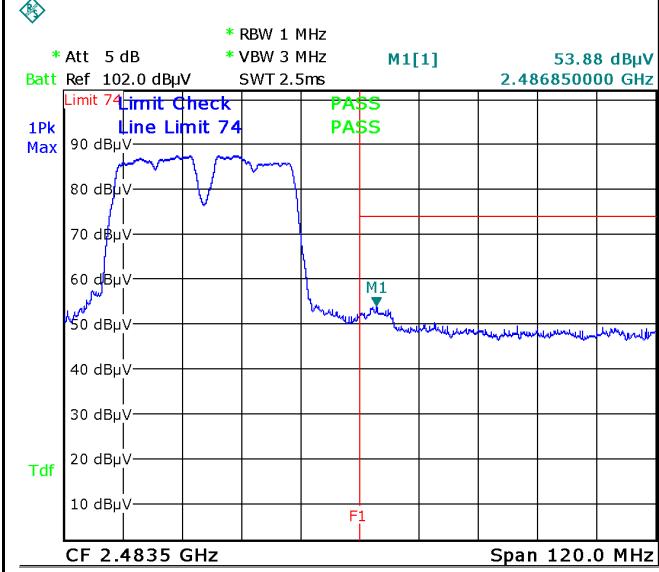
Test Plots

Band Edge measurement result





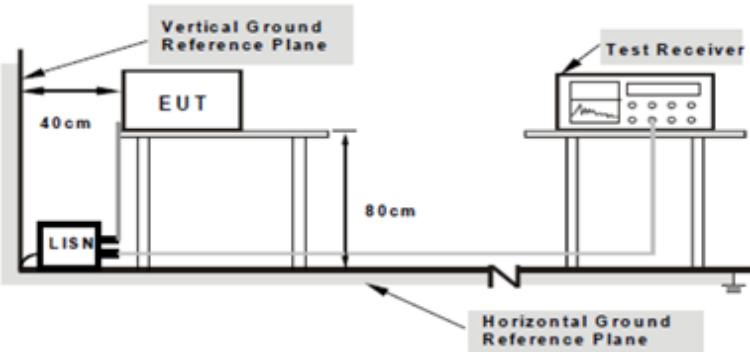
 <p>* RBW 1 MHz * Att 5 dB Batt Ref 102.0 dBμV M2[1] 48.33 dBμV SWT 2.5ms 2.36110000 GHz</p> <p>Limit Check Line Limit 74 1Pk Max 90 dBμV Tdf 50 dBμV M2 80 dBμV 60 dBμV 50 dBμV F2 40 dBμV 30 dBμV 20 dBμV 10 dBμV CF 2.39 GHz Span 80.0 MHz</p>	 <p>* RBW 1 MHz * Att 5 dB Batt Ref 102.0 dBμV M1[1] 48.33 dBμV SWT 2.5ms 2.49516000 GHz</p> <p>Limit 74 Limit Check Line Limit 74 1Pk Max 90 dBμV Tdf 50 dBμV M1 80 dBμV 70 dBμV 60 dBμV 50 dBμV 40 dBμV 30 dBμV 20 dBμV 10 dBμV CF 2.4835 GHz Span 80.0 MHz</p>
<p>Date: 19.JUN.2017 17:38:17</p> <p>Band Edge, Left Side (Peak) - 802.11n20</p> <p>Note: F1 is frequency 2400MHz; F2 is frequency 2390MHz</p>	<p>Date: 19.JUN.2017 17:45:12</p> <p>Band Edge, Right Side (Peak) - 802.11n20</p> <p>Note: F1 is frequency 2483.5MHz</p>
<p>Note: (no need if PK value less than the AV limit)</p>	<p>Note: (no need if PK value less than the AV limit)</p>
<p>Band Edge, Left Side (Average) - 802.11n20</p> <p>Note: F1 is frequency 2400MHz; F2 is frequency 2390MHz</p>	<p>Band Edge, Right Side (Average) - 802.11n20</p> <p>Note: F1 is frequency 2483.5MHz</p>

 <p>Limit Check Line Limit 74 PASS</p> <p>M1[1] 52.23 dBμV 2.399440000 GHz</p> <p>M2[1] 50.14 dBμV 2.387920000 GHz</p> <p>1Pk Max Tdf</p>	 <p>Limit Check Line Limit 74 PASS</p> <p>M1[1] 53.88 dBμV 2.486850000 GHz</p> <p>M1 F1</p> <p>1Pk Max Tdf</p>
<p>Date: 19.JUN.2017 17:40:25</p> <p>Band Edge, Left Side (Peak) - 802.11n40</p> <p>Note: F1 is frequency 2400MHz; F2 is frequency 2390MHz</p>	<p>Date: 19.JUN.2017 17:42:00</p> <p>Band Edge, Right Side (Peak) - 802.11n40</p> <p>Note: F1 is frequency 2483.5MHz</p>
<p>Note: (no need if PK value less than the AV limit)</p>	<p>Note: (no need if PK value less than the AV limit)</p>
<p>Band Edge, Left Side (Average) - 802.11n40</p> <p>Note: F1 is frequency 2400MHz; F2 is frequency 2390MHz</p>	<p>Band Edge, Right Side (Average) - 802.11n40</p> <p>Note: F1 is frequency 2483.5MHz</p>

6.6 AC Power Line Conducted Emissions

Temperature	24 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	June 15, 2017
Tested By :	Loren Luo

Requirement(s):

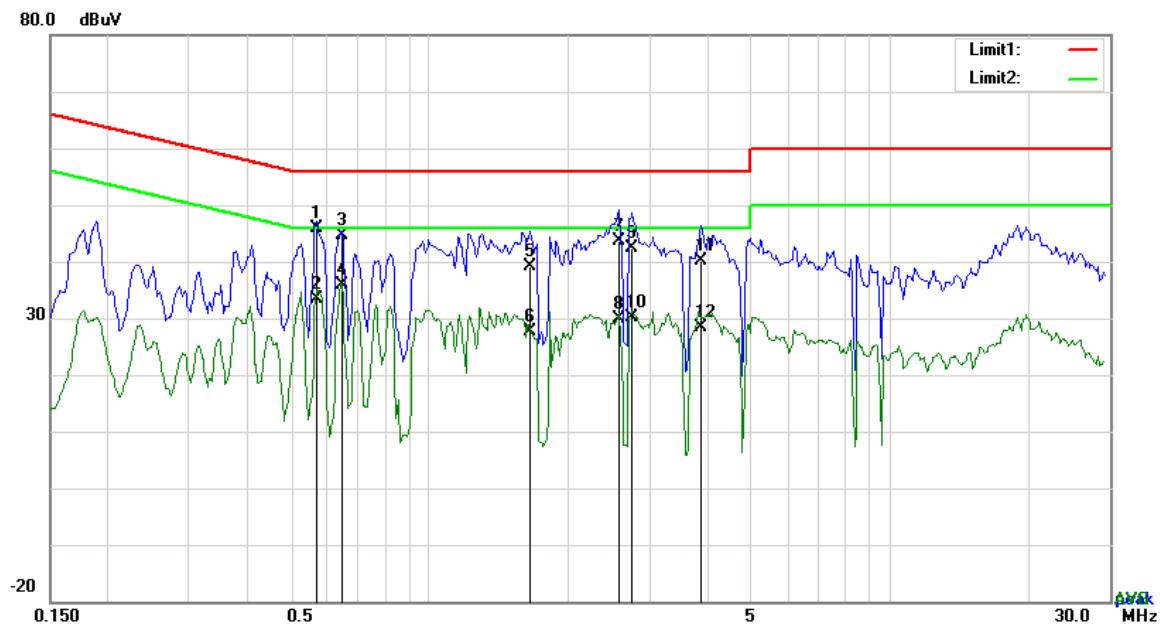
Spec	Item	Requirement	Applicable														
47CFR§15. 207, RSS210 (A8.1)	a)	<p>For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within 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 (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	<input checked="" type="checkbox"/>
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>																
Procedure	<ol style="list-style-type: none"> 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. The power supply for the EUT was fed through a 50W/50mH EUT LISN, connected to filtered mains. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss 																

	<p>coaxial cable.</p> <ol style="list-style-type: none"> 4. All other supporting equipment were powered separately from another main supply. 5. The EUT was switched on and allowed to warm up to its normal operating condition. 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. 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. 8. Step 7 was then repeated for the LIVE line (for AC mains) or DC line (for DC power).
Remark	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test Mode: Transmitting Mode



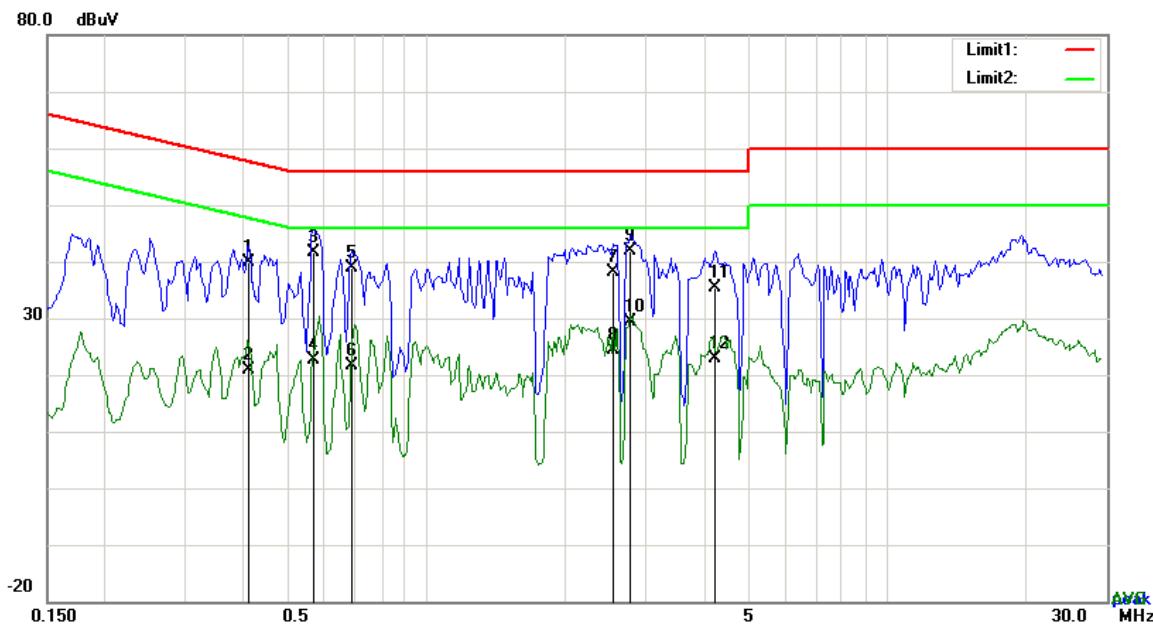
Test Data

Phase Line Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)
1	L1	0.5673	35.82	QP	10.03	45.85	56.00	-10.15
2	L1	0.5673	23.43	AVG	10.03	33.46	46.00	-12.54
3	L1	0.6453	34.55	QP	10.03	44.58	56.00	-11.42
4	L1	0.6453	25.80	AVG	10.03	35.83	46.00	-10.17
5	L1	1.6515	29.07	QP	10.04	39.11	56.00	-16.89
6	L1	1.6515	17.57	AVG	10.04	27.61	46.00	-18.39
7	L1	2.5758	33.65	QP	10.05	43.70	56.00	-12.30
8	L1	2.5758	19.76	AVG	10.05	29.81	46.00	-16.19
9	L1	2.7591	32.35	QP	10.05	42.40	56.00	-13.60
10	L1	2.7591	20.00	AVG	10.05	30.05	46.00	-15.95
11	L1	3.8931	29.94	QP	10.07	40.01	56.00	-15.99
12	L1	3.8931	18.23	AVG	10.07	28.30	46.00	-17.70

Test Mode:

Transmitting Mode

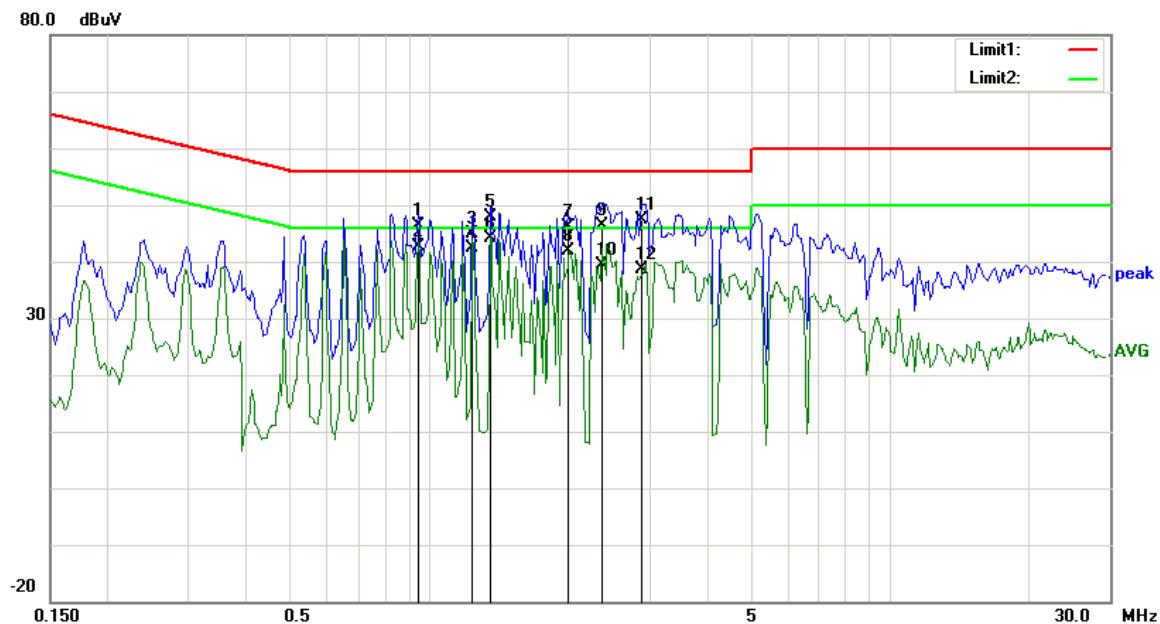


Test Data

Phase Neutral Plot at 120Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)
1	N	0.4113	29.74	QP	10.02	39.76	57.62	-17.86
2	N	0.4113	10.86	AVG	10.02	20.88	47.62	-26.74
3	N	0.5673	31.61	QP	10.02	41.63	56.00	-14.37
4	N	0.5673	12.69	AVG	10.02	22.71	46.00	-23.29
5	N	0.6882	28.98	QP	10.02	39.00	56.00	-17.00
6	N	0.6882	11.68	AVG	10.02	21.70	46.00	-24.30
7	N	2.5485	28.02	QP	10.05	38.07	56.00	-17.93
8	N	2.5485	14.23	AVG	10.05	24.28	46.00	-21.72
9	N	2.7786	31.91	QP	10.05	41.96	56.00	-14.04
10	N	2.7786	19.40	AVG	10.05	29.45	46.00	-16.55
11	N	4.2441	25.44	QP	10.06	35.50	56.00	-20.50
12	N	4.2441	12.81	AVG	10.06	22.87	46.00	-23.13

Test Mode: Transmitting Mode



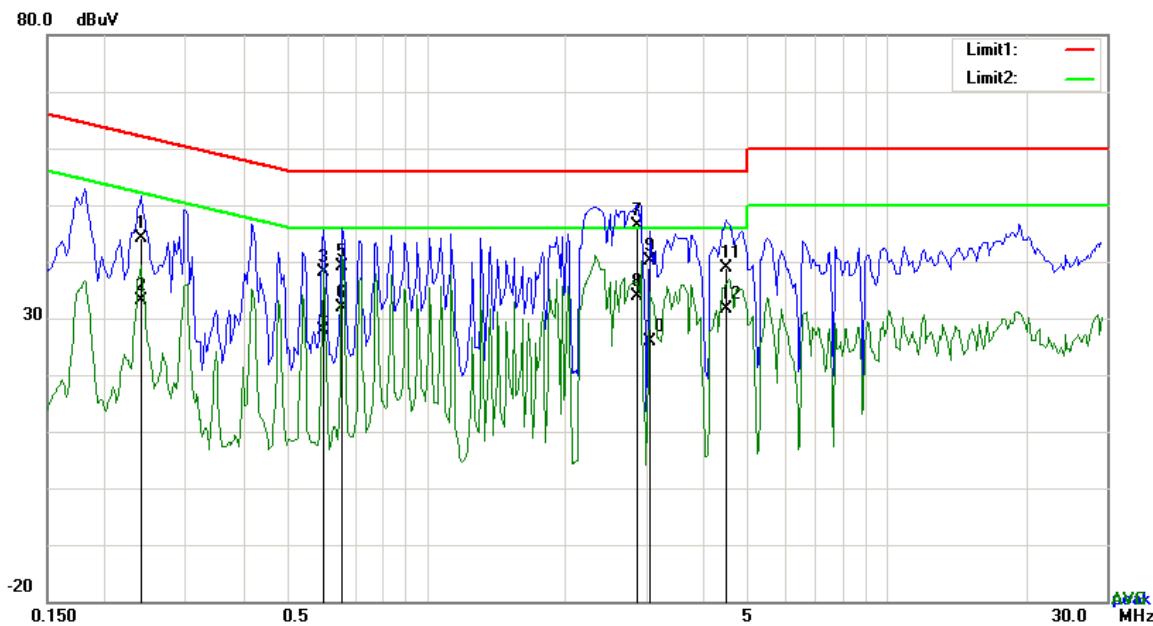
Test Data

Phase Line Plot at 240Vac, 60Hz

No.	P/L	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)
1	L1	0.9456	36.40	QP	10.03	46.43	56.00	-9.57
2	L1	0.9456	32.70	AVG	10.03	42.73	46.00	-3.27
3	L1	1.2420	34.93	QP	10.03	44.96	56.00	-11.04
4	L1	1.2420	32.36	AVG	10.03	42.39	46.00	-3.61
5	L1	1.3590	37.88	QP	10.03	47.91	56.00	-8.09
6	L1	1.3590	34.16	AVG	10.03	44.19	46.00	-1.81
7	L1	2.0103	36.06	QP	10.04	46.10	56.00	-9.90
8	L1	2.0103	31.84	AVG	10.04	41.88	46.00	-4.12
9	L1	2.3613	36.35	QP	10.05	46.40	56.00	-9.60
10	L1	2.3613	29.40	AVG	10.05	39.45	46.00	-6.55
11	L1	2.8917	37.36	QP	10.05	47.41	56.00	-8.59
12	L1	2.8917	28.49	AVG	10.05	38.54	46.00	-7.46

Test Mode:

Transmitting Mode



Test Data

Phase Neutral Plot at 240Vac, 60Hz

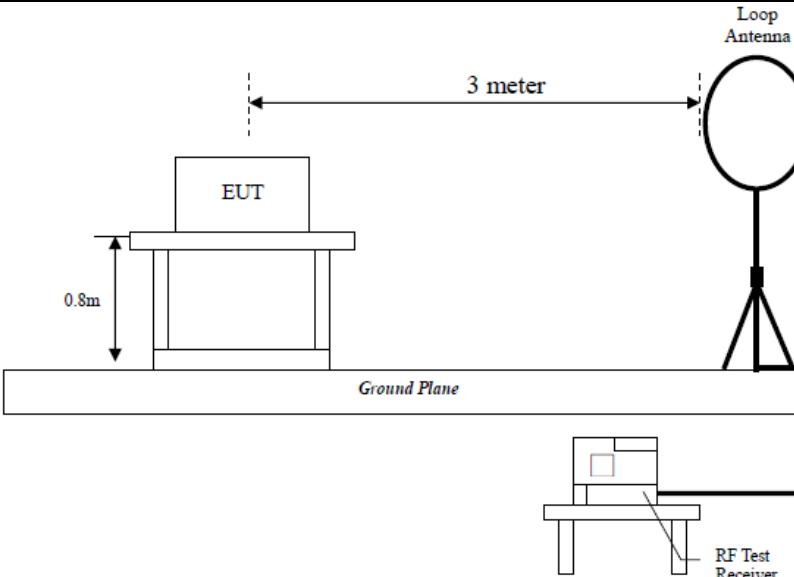
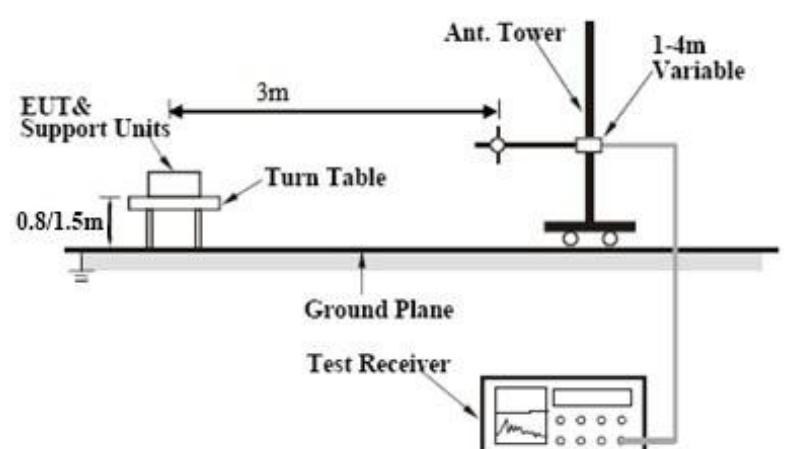
No.	P/L	Frequency (MHz)	Reading (dB μ V)	Detector	Corrected (dB)	Result (dB μ V)	Limit (dB μ V)	Margin (dB)
1	N	0.2397	33.99	QP	10.02	44.01	62.11	-18.10
2	N	0.2397	23.15	AVG	10.02	33.17	52.11	-18.94
3	N	0.5985	28.17	QP	10.02	38.19	56.00	-17.81
4	N	0.5985	17.89	AVG	10.02	27.91	46.00	-18.09
5	N	0.6570	29.07	QP	10.02	39.09	56.00	-16.91
6	N	0.6570	21.89	AVG	10.02	31.91	46.00	-14.09
7	N	2.8644	36.27	QP	10.05	46.32	56.00	-9.68
8	N	2.8644	23.86	AVG	10.05	33.91	46.00	-12.09
9	N	3.0468	30.07	QP	10.05	40.12	56.00	-15.88
10	N	3.0468	15.93	AVG	10.05	25.98	46.00	-20.02
11	N	4.4742	28.88	QP	10.06	38.94	56.00	-17.06
12	N	4.4742	21.59	AVG	10.06	31.65	46.00	-14.35

6.7 Radiated Spurious Emissions & Restricted Band

Temperature	24 °C
Relative Humidity	53%
Atmospheric Pressure	1010mbar
Test date :	June 15, 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 (μ V/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 (μ V/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"/>																

Test Setup  <p>The diagram shows a rectangular EUT (Equipment Under Test) mounted on a turntable. The turntable sits on a Ground Plane. A vertical Loop Antenna is positioned 3 meters away from the EUT. The height of the EUT above the ground plane is indicated as 0.8m.</p>  <p>The diagram shows a rectangular EUT & Support Units mounted on a turntable. The turntable sits on a Ground Plane. A vertical Ant. Tower is positioned 3m away from the EUT. The height of the EUT is 0.8/1.5m. The antenna tower has a 1-4m Variable height adjustment. An RF Test Receiver is connected to the tower.</p>	Procedure <ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 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"> a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasiy Peak detection at frequency below 1GHz. 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.
--	--

	<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

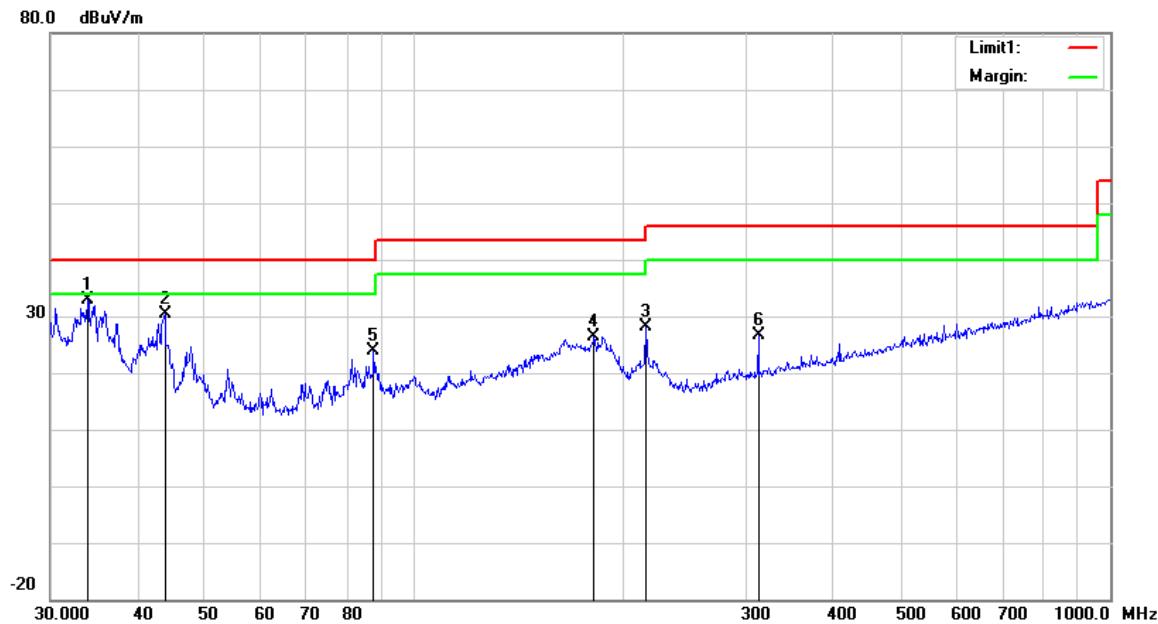


Test Data

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	V	33.9174	37.65	QP	18.38	22.26	0.73	34.50	40.00	-5.50	100	90
2	V	47.6586	47.32	QP	9.43	22.34	0.78	35.19	40.00	-4.81	100	113
3	V	155.9101	43.15	peak	12.60	22.30	1.37	34.82	43.50	-8.68	100	283
4	V	129.0146	36.17	peak	13.31	22.38	1.20	28.30	43.50	-15.20	100	186
5	V	87.4177	40.63	peak	7.90	22.35	1.01	27.19	40.00	-12.81	100	199
6	V	408.9460	29.65	peak	15.88	21.99	2.03	25.57	46.00	-20.43	100	299

30MHz -1GHz



Test Data

Horizontal Polarity Plot @3m

No.	P/L	Frequency (MHz)	Reading (dBuV/m)	Detect or	Ant_F (dB/m)	PA_G (dB)	Cab_L (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degr ee
1	H	33.9174	36.06	peak	18.38	22.26	0.73	32.91	40.00	-7.09	100	290
2	H	43.8119	40.62	peak	11.38	22.29	0.76	30.47	40.00	-9.53	100	158
3	H	215.2678	37.02	peak	11.89	22.35	1.59	28.15	43.50	-15.35	100	79
4	H	181.2834	36.16	peak	11.07	22.26	1.38	26.35	43.50	-17.15	100	259
5	H	87.4177	37.20	peak	7.90	22.35	1.01	23.76	40.00	-16.24	100	295
6	H	312.1794	33.06	peak	13.86	22.26	1.85	26.51	46.00	-19.49	100	91

Above 1GHz

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

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

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4844	39.15	AV	V	33.8	6.86	32.69	47.12	54	-6.88
4844	38.17	AV	H	33.8	6.86	32.69	46.14	54	-7.86
4844	47.64	PK	V	33.8	6.86	32.69	55.61	74	-18.39
4844	47.98	PK	H	33.8	6.86	32.69	55.95	74	-18.05
5432	23.8	AV	V	34.17	8.99	48.36	48.38	54	-5.62
5432	22.88	AV	H	34.17	8.99	48.36	47.46	54	-6.54
5432	39.24	PK	V	34.17	8.99	48.36	63.82	74	-10.18
5432	39.6	PK	H	34.17	8.99	48.36	64.18	74	-9.82

Middle Channel (2437 MHz) (n40 mode worst case)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4874	38.01	AV	V	33.6	6.82	32.71	45.72	54	-8.28
4874	39.39	AV	H	33.6	6.82	32.71	47.1	54	-6.9
4874	47.53	PK	V	33.6	6.82	32.71	55.24	74	-18.76
4874	47.94	PK	H	33.6	6.82	32.71	55.65	74	-18.35
9499	24.15	AV	V	38.99	9.67	48.16	48.77	54	-5.23
9499	22.47	AV	H	38.99	9.67	48.16	47.09	54	-6.91
9499	40.52	PK	V	38.99	9.67	48.16	65.14	74	-8.86
9499	39.87	PK	H	38.99	9.67	48.16	64.49	74	-9.51

High Channel (2452 MHz) (n40 mode worst case)

Frequency (MHz)	S.A. Reading (dB μ V)	Detector (PK/AV)	Polarity (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord Amp. (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
4904	39.76	AV	V	33.83	6.95	32.79	47.75	54	-6.25
4904	38.75	AV	H	33.83	6.95	32.79	46.74	54	-7.26
4904	47.27	PK	V	33.83	6.95	32.79	55.26	74	-18.74
4904	47.41	PK	H	33.83	6.95	32.79	55.4	74	-18.6
17005	22.7	AV	V	40.17	16.78	45.66	47.26	54	-6.74
17005	23.65	AV	H	40.17	16.78	45.66	48.21	54	-5.79
17005	40.12	PK	V	40.17	16.78	45.66	64.68	74	-9.32
17005	39.5	PK	H	40.17	16.78	45.66	64.06	74	-9.94

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.

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
AC Line Conducted					
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"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/23/2016	09/22/2017	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	08/31/2016	08/30/2017	<input checked="" type="checkbox"/>
RF conducted test					
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"/>
Radiated Emissions					
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"/>
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"/>

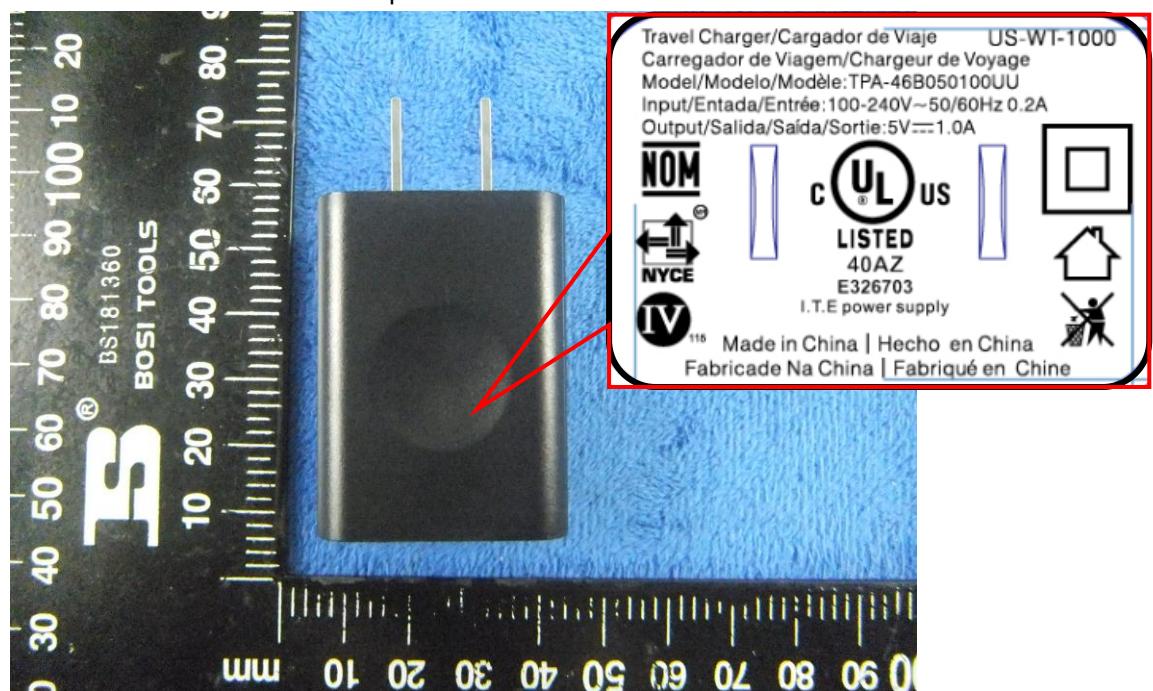
Annex B. EUT and Test Setup Photographs

Annex B.i. Photograph: EUT External Photo

Whole Package View



Adapter - Front View



EUT - Front View



EUT - Rear View

