



# FCC RF Test Report

**APPLICANT** : Planet Avvio LLC  
**EQUIPMENT** : router  
**BRAND NAME** : Avvio  
**MODEL NAME** : RT400  
**FCC ID** : 2ALTART400X  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure

The product was received on May 25, 2018 and testing was completed on Jun. 01, 2018. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.

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Approved by: Eric Shih / Manager



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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR852504C	Rev. 01	Initial issue of report	Jun. 11, 2018

## SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) & 15.209(a)	Pass	Under limit 9.73 dB at 17475.00 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 10.68 dB at 0.34 MHz
3.6	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.7	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

**Planet Avvio LLC**

9725 NW 117th Ave., Medley, FL 33178, United States

## 1.2 Manufacturer

**MeiG Smart Technology Co., Ltd**

#5 Lingxia Road, Fenghuang the 4th Industrial Park, Fuyong Street, Bao'an District, Shenzhen

## 1.3 Product Feature of Equipment Under Test

Product Feature	
<b>Equipment</b>	router
<b>Brand Name</b>	Avvio
<b>Model Name</b>	RT400
<b>FCC ID</b>	2ALTART400X
<b>EUT supports Radios application</b>	GSM/GPRS/EGPRS/WCDMA/HSPA/ HSPA+(16QAM uplink is not supported)/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80
<b>IMEI Code</b>	Conducted: 869715033008171 Conduction: NA Radiation: NA
<b>HW Version</b>	SLT768_V1.03_PCB
<b>SW Version</b>	SLT768-TAQ_1.0.5_EQ103
<b>EUT Stage</b>	Production Unit

**Remark:**

The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification			
<b>Tx/Rx Channel Frequency Range</b>	5745 MHz ~ 5825 MHz		
<b>Maximum Output Power</b>	<b>&lt;5745 MHz ~ 5825 MHz&gt;</b> <b>MIMO &lt;Ant. 1+2&gt;</b> 802.11a : 15.74 dBm / 0.0375 W 802.11n HT20 : 15.54 dBm / 0.0358 W 802.11n HT40 : 16.10 dBm / 0.0407 W 802.11ac VHT20: 13.60 dBm / 0.0229 W 802.11ac VHT40: 12.84 dBm / 0.0192 W 802.11ac VHT80: 12.49 dBm / 0.0177 W		
<b>99% Occupied Bandwidth</b>	<b>&lt;Ant. 1+2(1)&gt;</b> 802.11a : 16.83 MHz 802.11n HT20 : 17.78 MHz 802.11n HT40 : 36.06 MHz 802.11ac VHT80 : 74.93 MHz <b>&lt;Ant. 1+2(2)&gt;</b> 802.11a : 16.83 MHz 802.11n HT20 : 17.78 MHz 802.11n HT40 : 35.96 MHz 802.11ac VHT80 : 74.93 MHz		
<b>Type of Modulation</b>	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)		
<b>Antenna Type / Gain</b>	<Ant. 1> : External PCB Antenna with gain 4.20 dBi <Ant. 2> : External PCB Antenna with gain 4.20 dBi		
<b>Antenna Function Description</b>		Ant. 1	Ant. 2
	802.11 a/n/ac SISO	V	V
	802.11 a/n/ac MIMO	V	V

**Note:**

1. MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.
2. For 802.11n HT20/11ac VHT20 and 802.11n HT40/11ac VHT40 mode, the test was assessed by referring to the higher conducted power.
3. For SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to the higher conducted power

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 Testing Location

Sporton International (Shenzhen) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0) and the FCC designation No are CN5018 and CN5019.

<b>Test Site</b>	Sporton International (Shenzhen) Inc.		
<b>Test Site Location</b>	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC Test Firm Registration No.</b>
	TH01-SZ	CO01-SZ	251365

<b>Test Site</b>	Sporton International (Shenzhen) Inc.		
<b>Test Site Location</b>	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District Shenzhen City Guangdong Province 518055 China TEL: +86-755-3320-2398		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC Test Firm Registration No.</b>
	03CH04-SZ		577730

**Note:** The test site complies with ANSI C63.4 2014 requirement.

## 1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart E
- ♦ FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ ANSI C63.10-2013

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

## 2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5725-5850 MHz Band 4 (U-NII-3)	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155 <sup>#</sup>	5775	165	5825

**Note:**

1. The above Frequency and Channel in "\*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "<sup>#</sup>" were 802.11ac VHT80.



## 2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

### MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + LAN Link + WLAN Link(5GHz) + Telephone Link
Remark: For Radiated Test Cases, The tests were performance with Adapter.	

Ch. #		Band IV : 5725-5850 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

## 2.3 Connection Diagram of Test System



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	iPod	Apple	MC69029/A	FCC DoC	N/A	N/A
5.	Telephone	bossini	HCD133TSD	N/A	N/A	N/A



## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 5.3 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5.3 + 10 = 15.3 \text{ (dB)}\end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

##### 3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

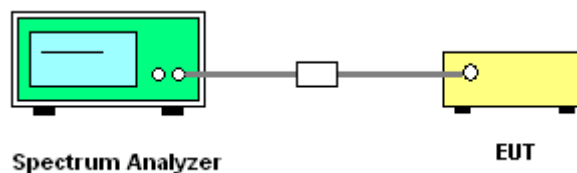
##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedures

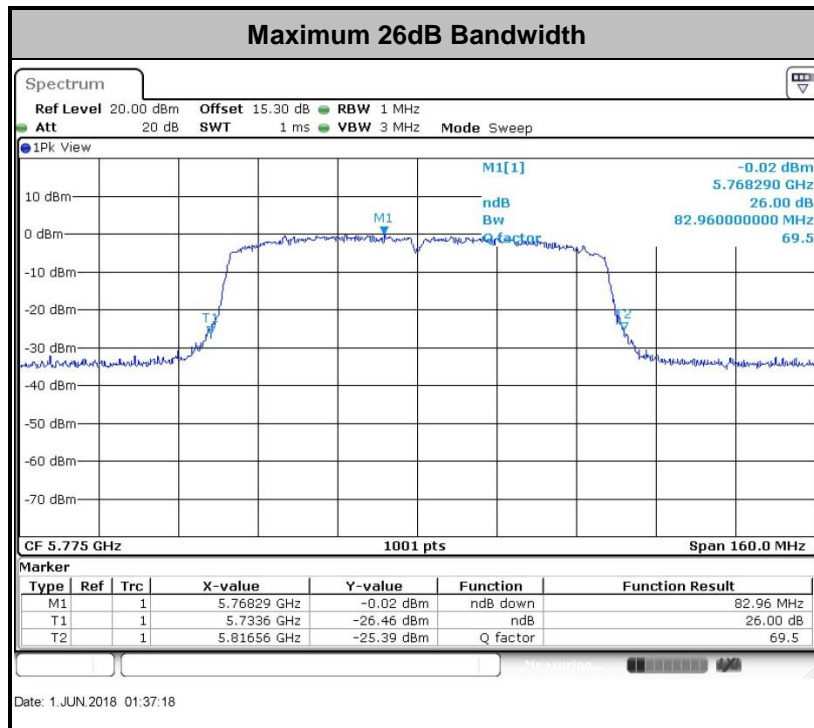
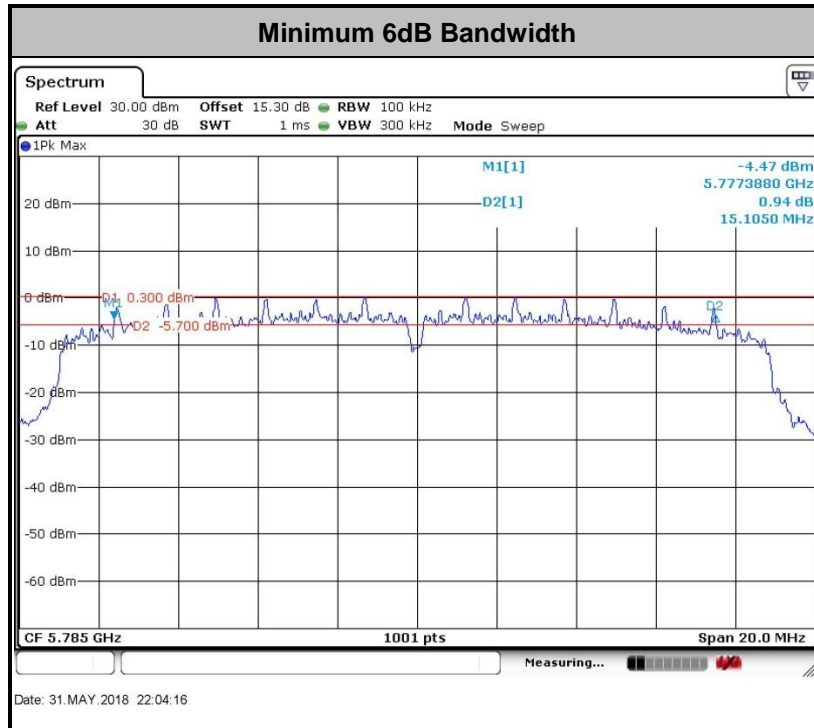
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.  
Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

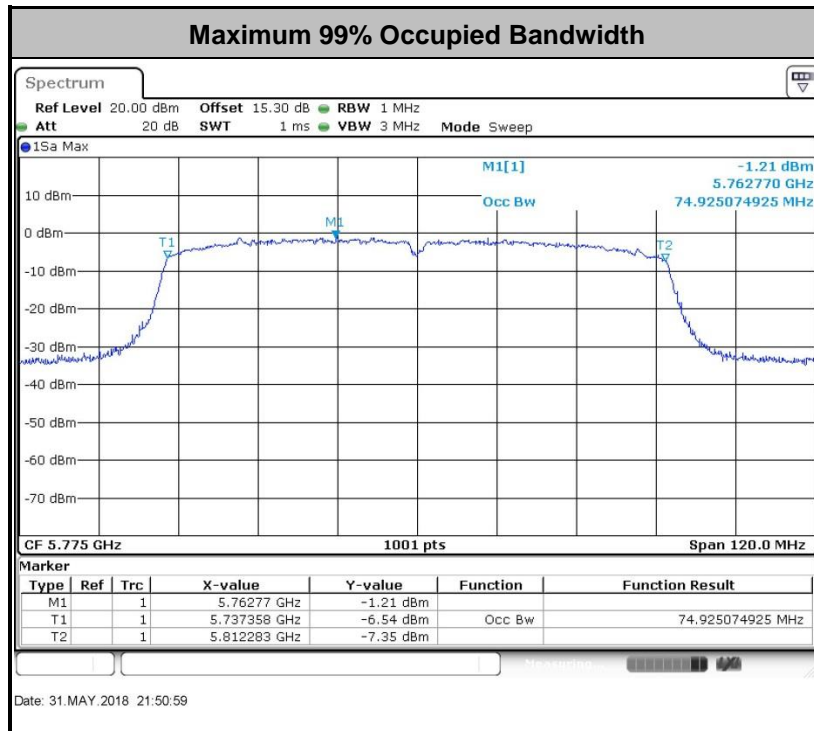
##### 3.1.4 Test Setup



##### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.





**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

## 3.2 Maximum Conducted Output Power Measurement

### 3.2.1 Limit of Maximum Conducted Output Power

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

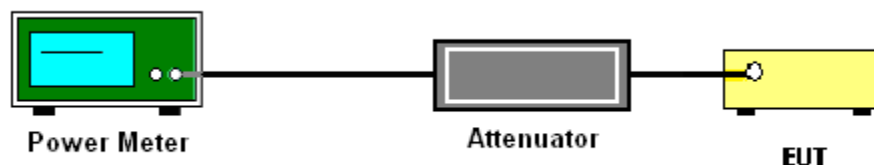
### 3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor,  $10 \log(1/x)$ , where  $x$  is the duty cycle.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.



### **3.3 Power Spectral Density Measurement**

#### **3.3.1 Limit of Power Spectral Density**

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **3.3.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

#### **3.3.3 Test Procedures**

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.  
Section F) Maximum power spectral density.

##### **# Method SA-2 #**

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW  $\geq$  1 MHz.
- Number of points in sweep  $\geq$  2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add  $10 \log(500\text{kHz}/\text{RBW})$  to the test result.
- Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add  $10 \log(1/0.25) = 6$  dB if the duty cycle is 25 percent.

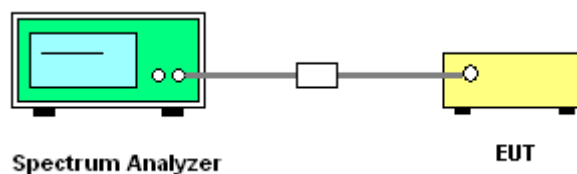


1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (c): Measure and add  $10 \log(N_{\text{ANT}})$  dB.

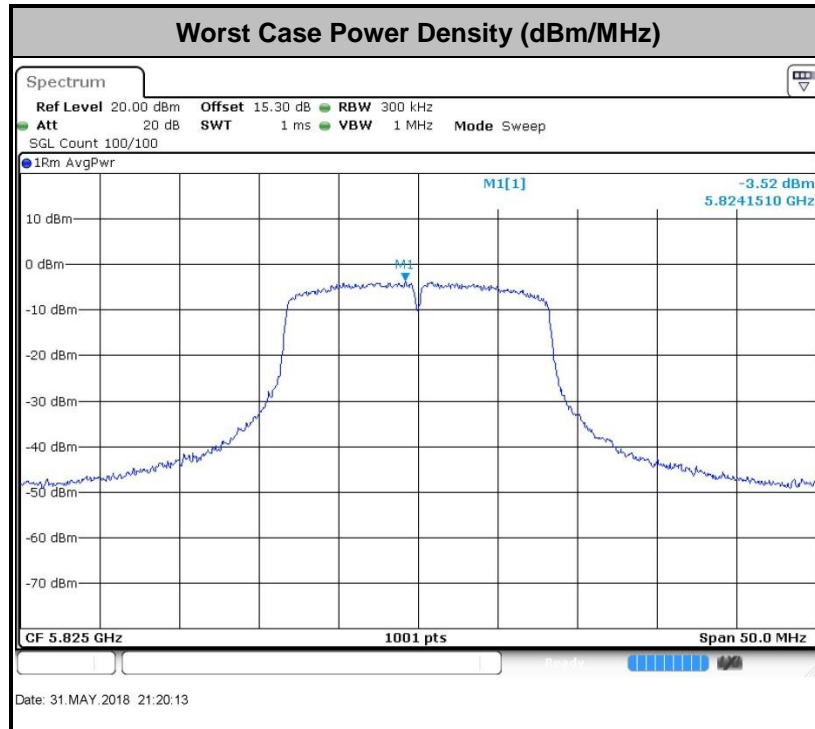
With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity  $10 \log(N_{\text{ANT}})$  dB is added to each spectrum value before comparing to the emission limit. The addition of  $10 \log(N_{\text{ANT}})$  dB serves to apportion the emission limit among the  $N_{\text{ANT}}$  outputs so that each output is permitted to contribute no more than  $1/N_{\text{ANT}}^{\text{th}}$  of the PSD limit.

### 3.3.4 Test Setup



### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



### 3.4 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

#### 3.4.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5.725-5.85 GHz band:

15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

- (2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

**Note:** The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \quad \mu\text{V/m, where P is the eirp (Watts)}$$

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27	68.3

(3) KDB789033 D02 v02r01 G)2)c)

- (i) Section 15.407(b)(1) to (b)(3) specify the unwanted emission limits for the U-NII-1 and U-NII-2 bands. As specified, emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz.<sup>3</sup>
- (ii) Section 15.407(b)(4) specifies the unwanted emission limit for the U-NII-3 band. A band emissions mask is specified in Section 15.407(b)(4)(i). The emission limits are in terms of a Peak detector. An alternative to the band emissions mask is specified in Section 15.407(b)(4)(ii). The alternative limits are based on the highest antenna gain specified in the filing. There are also marketing and importation restrictions for the devices using the alternative limit.<sup>4</sup>

**Note 3:** An out-of-band emission that complies with both the average and peak limits of Section 15.209 is not required to satisfy the -27 dBm/MHz peak emission limit.

**Note 4:** Only devices with antenna gains of 10 dBi or less may be approved using the emission limits specified in Section 15.247(d) till March 2, 2018; all other devices operating in this band must use the mask specified in Section 15.407(b)(4)(i).

### 3.4.2 Measuring Instruments

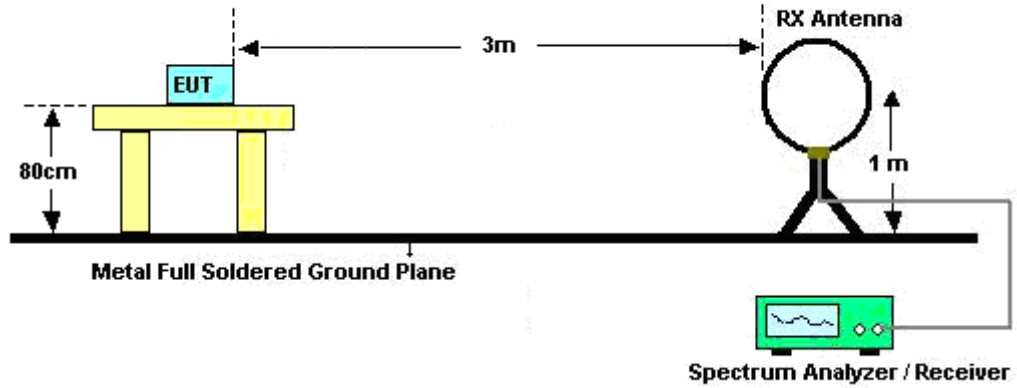
The measuring equipment is listed in the section 4 of this test report.

### 3.4.3 Test Procedures

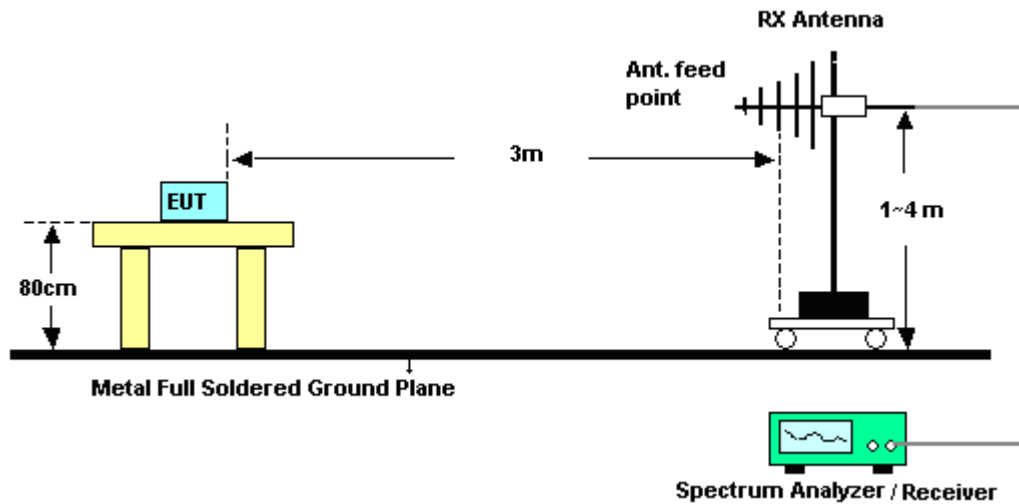
1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.  
Section G) Unwanted emissions measurement.
  - (1) Procedure for Unwanted Emissions Measurements Below 1000MHz
    - RBW = 120 kHz
    - VBW = 300 kHz
    - Detector = Peak
    - Trace mode = max hold
  - (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz
    - RBW = 1 MHz
    - VBW  $\geq$  3 MHz
    - Detector = Peak
    - Sweep time = auto
    - Trace mode = max hold
  - (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz
    - RBW = 1 MHz
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.4.4 Test Setup

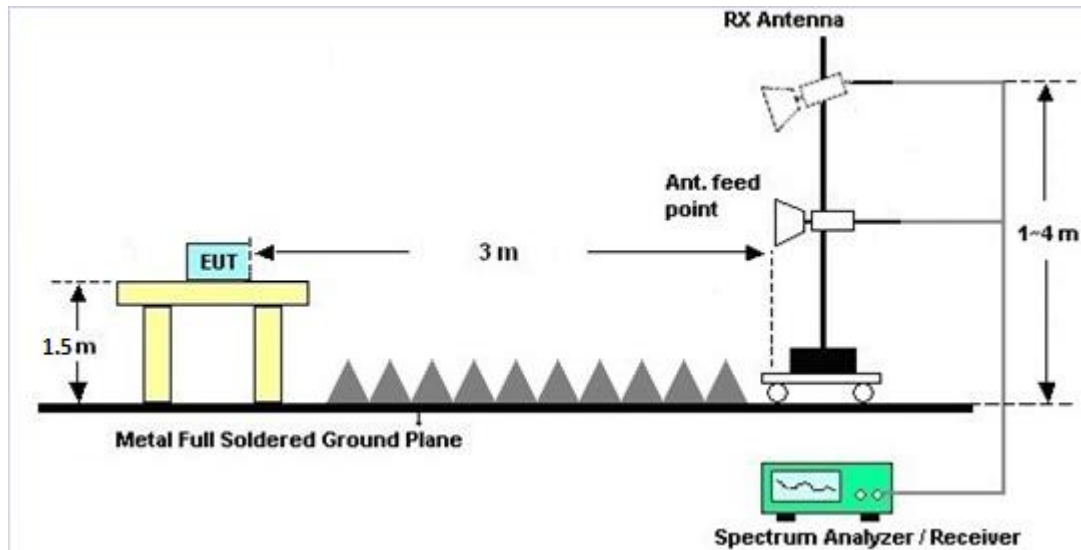
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix C.

### 3.4.7 Duty Cycle

Please refer to Appendix D.

### 3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

## 3.5 AC Conducted Emission Measurement

### 3.5.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### 3.5.2 Measuring Instruments

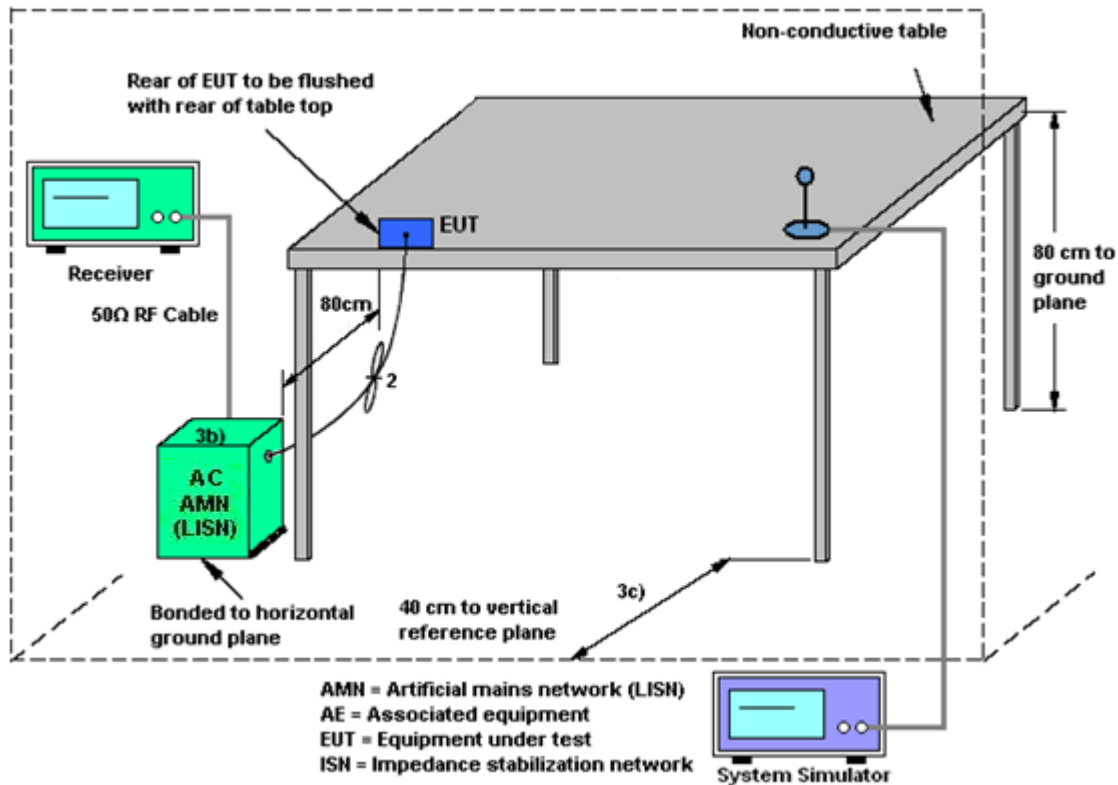
The measuring equipment is listed in the section 4 of this test report.

### 3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.



### 3.5.4 Test Setup



### 3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## **3.6 Automatically Discontinue Transmission**

### **3.6.1 Limit of Automatically Discontinue Transmission**

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

### **3.6.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

### **3.6.3 Test Result of Automatically Discontinue Transmission**

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

### 3.7 Antenna Requirements

#### 3.7.1 Standard Applicable

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used. (For Internal PCB Antenna)

A non-standard SMA connector antenna is used. (For External PCB Antenna)

#### 3.7.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G<sub>ANT</sub> + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(NANT/NSS=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G<sub>ANT</sub> set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G<sub>ANT</sub> is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

			DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
	Ant 1 (dBi)	Ant 2 (dBi)				
Band IV	4.20	4.20	4.20	7.21	0.00	1.21

$$PSD \text{ limit reduction} = \text{Composite gain} + PSD \text{ Array gain} - 6dBi = 1.21dB$$



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	Apr. 19, 2018	May 30, 2018~ Jun. 01, 2018	Apr. 18, 2019	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 26, 2017	May 30, 2018~ Jun. 01, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 26, 2017	May 30, 2018~ Jun. 01, 2018	Dec. 25, 2018	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Apr. 19, 2018	May 30, 2018~ Jun. 01, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Apr. 19, 2018	May 30, 2018~ Jun. 01, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2018	May 30, 2018~ Jun. 01, 2018	May 13, 2019	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Aug. 29, 2017	May 30, 2018~ Jun. 01, 2018	Aug. 28, 2018	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-128 5	1GHz~18GHz	Dec. 13, 2017	May 30, 2018~ Jun. 01, 2018	Dec. 12, 2018	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Apr. 20, 2018	May 30, 2018~ Jun. 01, 2018	Apr. 19, 2019	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz~3000MHz	Oct. 19, 2017	May 30, 2018~ Jun. 01, 2018	Oct. 18, 2018	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P-R	1989346	1GHz~18GHz	Jul. 27, 2017	May 30, 2018~ Jun. 01, 2018	Jul. 26, 2018	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1988315	18GHz~40GHz	Jul. 27, 2017	May 30, 2018~ Jun. 01, 2018	Jul. 26, 2018	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY532701 56	500MHz~26.5GHz	Apr. 19, 2018	May 30, 2018~ Jun. 01, 2018	Apr. 18, 2019	Radiation (03CH04-SZ)
AC Power Source	Chroma	61601	N/A	N/A	NCR	May 30, 2018~ Jun. 01, 2018	NCR	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	May 30, 2018~ Jun. 01, 2018	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	May 30, 2018~ Jun. 01, 2018	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 26, 2017	May 31, 2018	Dec. 25, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Dec. 26, 2017	May 31, 2018	Dec. 25, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103892	9kHz~30MHz	Nov. 01, 2017	May 31, 2018	Oct. 31, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000 891	100Vac~250Vac	Jul. 19, 2017	May 31, 2018	Jul. 18, 2018	Conduction (CO01-SZ)

NCR: No Calibration Required

## 5 Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.6dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1 dB
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.8 dB
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.1 dB
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**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Wilson Chen	Temperature:	24~26	°C
Test Date:	2018/5/30~2018/6/1	Relative Humidity:	50~53	%

**TEST RESULTS DATA**  
**6dB and 26dB EBW and 99% OBW**

Band IV													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)		26dB Bandwidth (MHz)		6 dB Bandwidth (MHz)		6 dB Bandwidth Min. Limit (MHz)		Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	16.83	16.78	21.08	20.23	15.33	15.13	0.5		Pass
11a	6Mbps	2	157	5785	16.78	16.83	20.63	20.48	15.33	15.13	0.5		Pass
11a	6Mbps	2	165	5825	16.73	16.83	20.63	20.13	15.33	15.15	0.5		Pass
HT20	MCS0	2	149	5745	17.73	17.78	21.93	21.58	15.13	15.13	0.5		Pass
HT20	MCS0	2	157	5785	17.73	17.78	21.98	21.53	15.11	15.11	0.5		Pass
HT20	MCS0	2	165	5825	17.78	17.78	21.68	21.63	15.15	15.15	0.5		Pass
HT40	MCS0	2	151	5755	36.06	35.96	42.17	41.99	35.05	35.05	0.5		Pass
HT40	MCS0	2	159	5795	36.06	35.96	42.98	42.35	35.13	35.05	0.5		Pass
VHT80	MCS0	2	155	5775	74.93	74.93	82.96	82.48	75.05	75.05	0.5		Pass

**TEST RESULTS DATA**  
**Average Power Table**

Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)			Pass/Fail
					Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2		
11a	6Mbps	2	149	5745	0.18	0.20	11.79	13.50	15.74	30.00		3.20			Pass
11a	6Mbps	2	157	5785	0.18	0.20	11.54	13.27	15.50	30.00		3.20			Pass
11a	6Mbps	2	165	5825	0.18	0.20	11.45	13.13	15.38	30.00		3.20			Pass
HT20	MCS0	2	149	5745	0.19	0.21	11.57	13.32	15.54	30.00		3.20			Pass
HT20	MCS0	2	157	5785	0.19	0.21	11.34	13.05	15.29	30.00		3.20			Pass
HT20	MCS0	2	165	5825	0.19	0.21	11.21	12.94	15.17	30.00		3.20			Pass
HT40	MCS0	2	151	5755	0.38	0.38	12.17	13.85	16.10	30.00		3.20			Pass
HT40	MCS0	2	159	5795	0.38	0.38	11.91	13.60	15.85	30.00		3.20			Pass
VHT20	MCS0	2	149	5745	0.19	0.19	9.67	11.35	13.60	30.00		3.20			Pass
VHT20	MCS0	2	157	5785	0.19	0.19	9.48	11.13	13.39	30.00		3.20			Pass
VHT20	MCS0	2	165	5825	0.19	0.19	9.32	10.97	13.23	30.00		3.20			Pass
VHT40	MCS0	2	151	5755	0.41	0.43	9.02	10.51	12.84	30.00		3.20			Pass
VHT40	MCS0	2	159	5795	0.41	0.43	8.70	10.31	12.59	30.00		3.20			Pass
VHT80	MCS0	2	155	5775	0.76	0.78	8.71	10.12	12.49	30.00		3.20			Pass

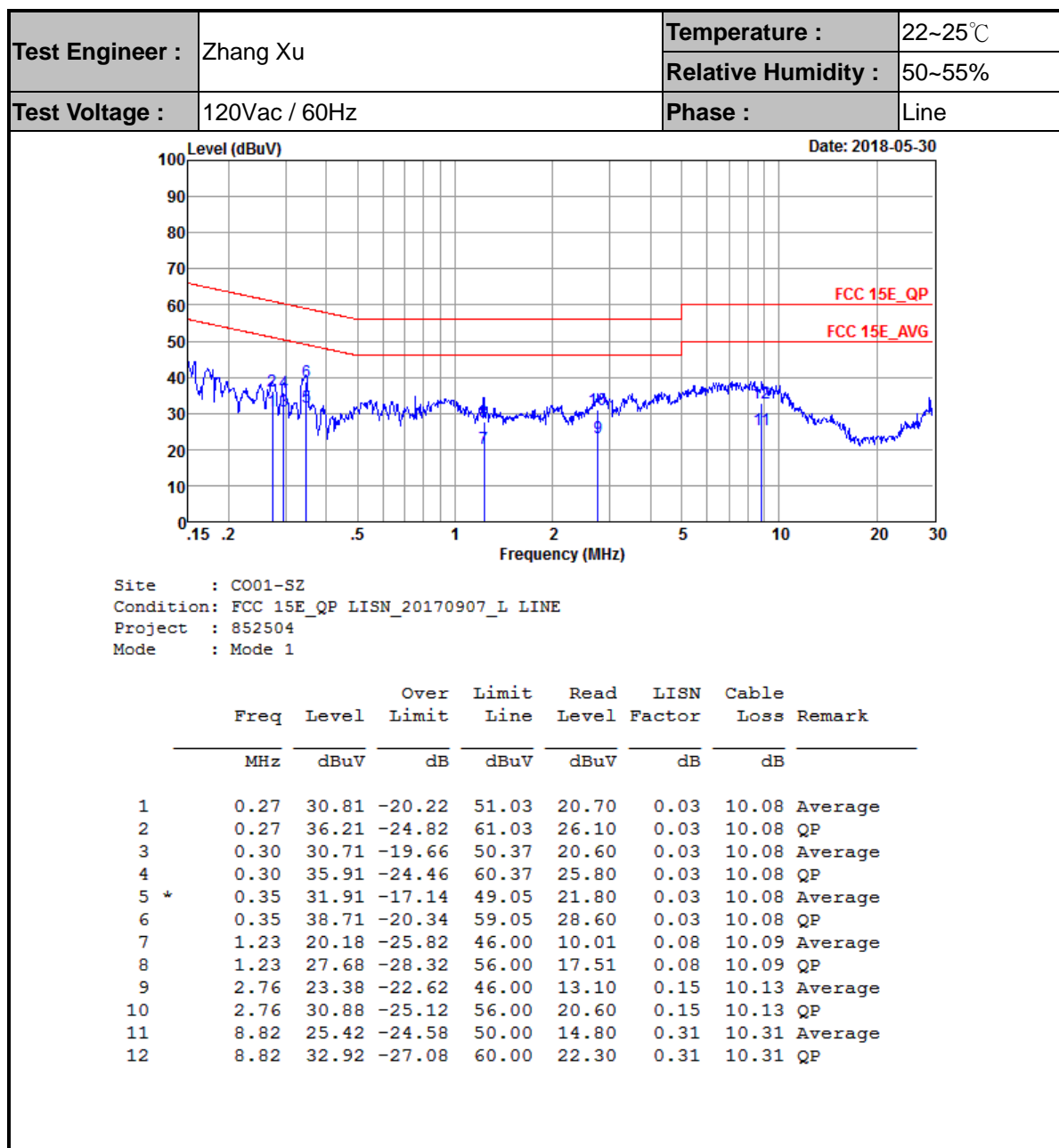


**TEST RESULTS DATA**  
**Power Spectral Density**

Band IV																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		10log (500kHz /RBW) Factor (dB)		Average Power Density (dBm/500kHz)			Average PSD Limit (dBm/500kHz)		DG (dBi)		Pass /Fail
					Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	5745	0.18	0.20	2.22					1.73	28.79	7.21	Pass	
11a	6Mbps	2	157	5785	0.18	0.20	2.22					1.59	28.79	7.21	Pass	
11a	6Mbps	2	165	5825	0.18	0.20	2.22					1.90	28.79	7.21	Pass	
HT20	MCS0	2	149	5745	0.19	0.21	2.22					1.60	28.79	7.21	Pass	
HT20	MCS0	2	157	5785	0.19	0.21	2.22					1.25	28.79	7.21	Pass	
HT20	MCS0	2	165	5825	0.19	0.21	2.22					1.17	28.79	7.21	Pass	
HT40	MCS0	2	151	5755	0.38	0.38	2.22					-0.79	28.79	7.21	Pass	
HT40	MCS0	2	159	5795	0.38	0.38	2.22					-0.76	28.79	7.21	Pass	
VHT80	MCS0	2	155	5775	0.76	0.78	2.22					-8.18	28.79	7.21	Pass	

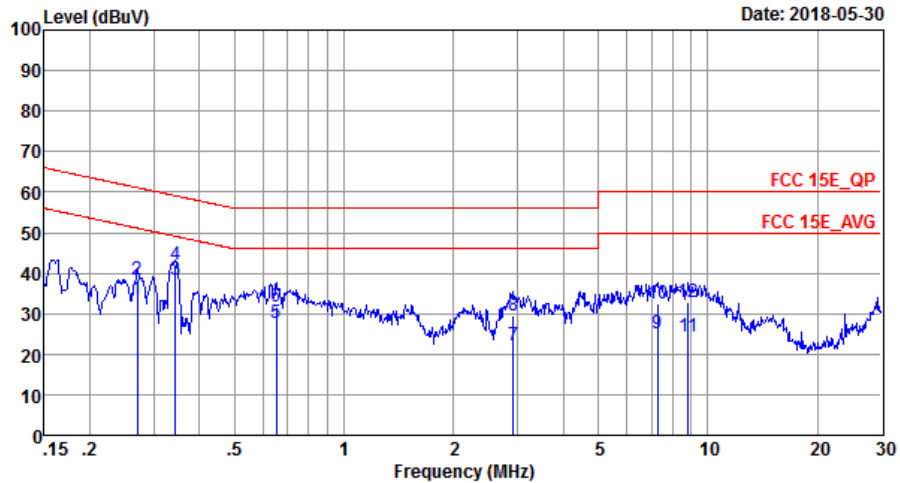


## Appendix B. AC Conducted Emission Test Results





Test Engineer :	Zhang Xu	Temperature :	22~25℃
		Relative Humidity :	50~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral



Site : C001-SZ  
Condition: FCC 15E\_QP LISN\_20170907\_N NEUTRAL  
Project : 852504  
Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.27	33.71	-17.41	51.12	23.60	0.03	10.08	Average
2	0.27	38.21	-22.91	61.12	28.10	0.03	10.08	QP
3 *	0.34	38.41	-10.68	49.09	28.30	0.03	10.08	Average
4	0.34	41.91	-17.18	59.09	31.80	0.03	10.08	QP
5	0.65	27.80	-18.20	46.00	17.70	0.02	10.08	Average
6	0.65	31.90	-24.10	56.00	21.80	0.02	10.08	QP
7	2.92	21.97	-24.03	46.00	11.80	0.03	10.14	Average
8	2.92	29.37	-26.63	56.00	19.20	0.03	10.14	QP
9	7.29	24.94	-25.06	50.00	14.60	0.08	10.26	Average
10	7.29	32.54	-27.46	60.00	22.20	0.08	10.26	QP
11	8.82	24.43	-25.57	50.00	13.99	0.13	10.31	Average
12	8.82	32.93	-27.07	60.00	22.49	0.13	10.31	QP



## Appendix C. Radiated Spurious Emission

### Band 4 - 5725~5850MHz

#### WIFI 802.11a (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11a CH 149 5745MHz		5615.4	52.17	-16.03	68.2	40.36	32.39	6.27	26.85	100	326	P	H
		5686.8	51.84	-43.62	95.46	40.04	32.45	6.23	26.88	100	326	P	H
		5713.8	51.48	-57.59	109.07	39.69	32.46	6.22	26.89	100	326	P	H
		5724.8	50.8	-70.94	121.74	38.99	32.48	6.22	26.89	100	326	P	H
	*	5745	95.25	-	-	83.46	32.49	6.2	26.9	100	326	P	H
	*	5745	89.1	-	-	77.31	32.49	6.2	26.9	100	326	A	H
		5625.8	52.58	-15.62	68.2	40.79	32.39	6.25	26.85	293	234	P	V
		5667.6	52.42	-28.84	81.26	40.63	32.43	6.23	26.87	293	234	P	V
		5718.4	52.37	-57.98	110.35	40.56	32.48	6.22	26.89	293	234	P	V
		5725	60.37	-61.83	122.2	48.56	32.48	6.22	26.89	293	234	P	V
	*	5745	106.57	-	-	94.78	32.49	6.2	26.9	293	234	P	V
	*	5745	101.35	-	-	89.56	32.49	6.2	26.9	293	234	A	V



WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11a CH 157 5785MHz		5624.6	52.02	-16.18	68.2	40.23	32.39	6.25	26.85	100	326	P	H
		5694.8	51.06	-50.31	101.37	39.26	32.45	6.23	26.88	100	326	P	H
		5707.8	51.1	-56.29	107.39	39.31	32.46	6.22	26.89	100	326	P	H
		5720.4	50.75	-60.96	111.71	38.94	32.48	6.22	26.89	100	326	P	H
	*	5785	92.17	-	-	80.39	32.52	6.18	26.92	100	326	P	H
	*	5785	87.18	-	-	75.4	32.52	6.18	26.92	100	326	A	H
		5850.8	50.86	-69.52	120.38	38.93	32.58	6.29	26.94	100	326	P	H
		5861.4	51.91	-57.1	109.01	39.86	32.6	6.4	26.95	100	326	P	H
		5903	51.34	-33.1	84.44	39.1	32.68	6.52	26.96	100	326	P	H
		5928.8	51.92	-16.28	68.2	39.61	32.76	6.52	26.97	100	326	P	H
		5631.8	52.06	-16.14	68.2	40.28	32.39	6.25	26.86	292	237	P	V
		5668	50.87	-30.69	81.56	39.08	32.43	6.23	26.87	292	237	P	V
		5710.6	51.16	-57.01	108.17	39.37	32.46	6.22	26.89	292	237	P	V
		5723.8	49.88	-69.58	119.46	38.07	32.48	6.22	26.89	292	237	P	V
	*	5785	106.59	-	-	94.81	32.52	6.18	26.92	292	237	P	V
	*	5785	101.37	-	-	89.59	32.52	6.18	26.92	292	237	A	V
		5854.8	51.88	-59.38	111.26	39.93	32.6	6.29	26.94	292	237	P	V
		5865	51.93	-56.07	108	39.88	32.6	6.4	26.95	292	237	P	V
		5901	52.1	-33.82	85.92	39.86	32.68	6.52	26.96	292	237	P	V
		5946	50.71	-17.49	68.2	38.26	32.8	6.63	26.98	292	237	P	V



WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11a CH 165 5825MHz	*	5825	92.5	-	-	80.57	32.57	6.29	26.93	100	326	P	H
	*	5825	87.5	-	-	75.57	32.57	6.29	26.93	100	326	A	H
		5851	51.31	-68.61	119.92	39.38	32.58	6.29	26.94	100	326	P	H
		5865	51.04	-56.96	108	38.99	32.6	6.4	26.95	100	326	P	H
		5893.8	52.2	-39.05	91.25	40.08	32.68	6.4	26.96	100	326	P	H
		5925.4	52.04	-16.16	68.2	39.73	32.76	6.52	26.97	100	326	P	H
	*	5825	106.32	-	-	94.39	32.57	6.29	26.93	282	236	P	V
	*	5825	100.68	-	-	88.75	32.57	6.29	26.93	282	236	A	V
		5851.8	51.29	-66.81	118.1	39.36	32.58	6.29	26.94	282	236	P	V
		5859	51.95	-57.73	109.68	39.9	32.6	6.4	26.95	282	236	P	V
		5883.4	51.16	-47.8	98.96	39.08	32.64	6.4	26.96	282	236	P	V
		5925.6	52.7	-15.5	68.2	40.39	32.76	6.52	26.97	282	236	P	V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



## Band 4 5725~5850MHz

## WIFI 802.11a (Harmonic @ 3m)

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11a CH 149 5745MHz		11490	50.43	-23.57	74	57.01	39.28	9.5	55.36	160	360	P	H
		17235	55.6	-12.6	68.2	54.16	43.04	14.89	56.49	170	360	P	H
		11490	50.29	-23.71	74	56.87	39.28	9.5	55.36	160	360	P	V
		17235	56.06	-12.14	68.2	54.62	43.04	14.89	56.49	170	360	P	V
802.11a CH 157 5785MHz		11570	49.68	-24.32	74	56.1	39.3	9.52	55.24	175	198	P	H
		17355	57.24	-10.96	68.2	54.89	43.81	15.12	56.58	189	185	P	H
		11570	50.05	-23.95	74	56.47	39.3	9.52	55.24	175	198	P	V
		17355	57.16	-11.04	68.2	54.81	43.81	15.12	56.58	189	185	P	V
802.11a CH 165 5825MHz		11650	49.73	-24.27	74	56.02	39.3	9.54	55.13	156	347	P	H
		17475	57.41	-10.79	68.2	54.15	44.58	15.36	56.68	150	360	P	H
		11650	50.14	-23.86	74	56.43	39.3	9.54	55.13	156	347	P	V
		17475	58.17	-10.03	68.2	54.91	44.58	15.36	56.68	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## Band 4 5725~5850MHz

## WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 149 5745MHz		5603.2	52.64	-15.56	68.2	40.83	32.39	6.27	26.85	100	326	P	H
		5662.4	50.69	-26.72	77.41	38.91	32.42	6.23	26.87	100	326	P	H
		5719.8	50.97	-59.77	110.74	39.16	32.48	6.22	26.89	100	326	P	H
		5724	50.94	-68.98	119.92	39.13	32.48	6.22	26.89	100	326	P	H
	*	5745	95.3	-	-	83.51	32.49	6.2	26.9	100	326	P	H
	*	5745	87.99	-	-	76.2	32.49	6.2	26.9	100	326	P	H
		5601	52.2	-16	68.2	40.38	32.39	6.27	26.84	108	45	P	V
		5697	52.77	-50.22	102.99	40.97	32.45	6.23	26.88	108	45	P	V
		5714.2	53.41	-55.77	109.18	41.62	32.46	6.22	26.89	108	45	P	V
		5725	59.07	-63.13	122.2	47.26	32.48	6.22	26.89	108	45	P	V
	*	5745	106.01	-	-	94.22	32.49	6.2	26.9	108	45	P	V
	*	5745	100.49	-	-	88.7	32.49	6.2	26.9	108	45	A	V





WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 157 5785MHz		5642.2	51.07	-17.13	68.2	39.28	32.4	6.25	26.86	100	327	P	H
		5659.4	52.91	-22.27	75.18	41.11	32.42	6.25	26.87	100	327	P	H
		5703.6	50.51	-55.7	106.21	38.71	32.46	6.22	26.88	100	327	P	H
		5722.4	49.57	-66.7	116.27	37.76	32.48	6.22	26.89	100	327	P	H
	*	5785	94.7	-	-	82.92	32.52	6.18	26.92	100	327	P	H
	*	5785	88.6	-	-	76.82	32.52	6.18	26.92	100	327	A	H
		5851.4	50.25	-68.76	119.01	38.32	32.58	6.29	26.94	100	327	P	H
		5856.8	52.24	-58.06	110.3	40.18	32.6	6.4	26.94	100	327	P	H
		5909.2	52.37	-27.49	79.86	40.1	32.72	6.52	26.97	100	327	P	H
		5948	52.04	-16.16	68.2	39.59	32.8	6.63	26.98	100	327	P	H
		5600.8	52.78	-15.42	68.2	40.96	32.39	6.27	26.84	104	43	P	V
		5659.2	51.79	-23.24	75.03	39.99	32.42	6.25	26.87	104	43	P	V
		5708.6	52	-55.61	107.61	40.21	32.46	6.22	26.89	104	43	P	V
		5724.4	50.31	-70.52	120.83	38.5	32.48	6.22	26.89	104	43	P	V
	*	5785	106.06	-	-	94.28	32.52	6.18	26.92	104	43	P	V
	*	5785	99.53	-	-	87.75	32.52	6.18	26.92	104	43	A	V
		5851.8	51.3	-66.8	118.1	39.37	32.58	6.29	26.94	104	43	P	V
		5858.8	51.99	-57.74	109.73	39.94	32.6	6.4	26.95	104	43	P	V
		5923.6	51.45	-17.78	69.23	39.14	32.76	6.52	26.97	104	43	P	V
		5940.4	52.14	-16.06	68.2	39.69	32.8	6.63	26.98	104	43	P	V



WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 165 5825MHz	*	5825	92.22	-	-	80.29	32.57	6.29	26.93	100	326	P	H
	*	5825	87.34	-	-	75.41	32.57	6.29	26.93	100	326	A	H
		5855	50.36	-60.44	110.8	38.41	32.6	6.29	26.94	100	326	P	H
		5856.8	50.46	-59.84	110.3	38.4	32.6	6.4	26.94	100	326	P	H
		5916	52.16	-22.68	74.84	39.89	32.72	6.52	26.97	100	326	P	H
		5932.2	52.69	-15.51	68.2	40.38	32.76	6.52	26.97	100	326	P	H
	*	5825	106.25	-	-	94.32	32.57	6.29	26.93	104	45	P	V
	*	5825	100.33	-	-	88.4	32.57	6.29	26.93	104	45	A	V
		5850	52.61	-69.59	122.2	40.68	32.58	6.29	26.94	104	45	P	V
		5871.8	52.2	-53.89	106.09	40.11	32.64	6.4	26.95	104	45	P	V
		5906.6	52.04	-29.74	81.78	39.76	32.72	6.52	26.96	104	45	P	V
		5941.8	51.85	-16.35	68.2	39.4	32.8	6.63	26.98	104	45	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 4 5725~5850MHz**  
**WIFI 802.11n HT20 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT20 CH 149 5745MHz		11490	50.14	-23.86	74	56.72	39.28	9.5	55.36	160	360	P	H
		17235	56.44	-11.76	68.2	55	43.04	14.89	56.49	170	360	P	H
		11490	50.65	-23.35	74	57.23	39.28	9.5	55.36	160	360	P	V
		17235	58.04	-10.16	68.2	56.6	43.04	14.89	56.49	170	360	P	V
802.11n HT20 CH 157 5785MHz		11570	50.55	-23.45	74	56.97	39.3	9.52	55.24	175	198	P	H
		17355	58.23	-9.97	68.2	55.88	43.81	15.12	56.58	189	185	P	H
		11570	49.95	-24.05	74	56.37	39.3	9.52	55.24	175	198	P	V
		17355	57.51	-10.69	68.2	55.16	43.81	15.12	56.58	189	185	P	V
802.11n HT20 CH 165 5825MHz		11650	49.77	-24.23	74	56.06	39.3	9.54	55.13	156	347	P	H
		17475	57.82	-10.38	68.2	54.56	44.58	15.36	56.68	150	360	P	H
		11650	50.49	-23.51	74	56.78	39.3	9.54	55.13	156	347	P	V
		17475	58.47	-9.73	68.2	55.21	44.58	15.36	56.68	150	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## Band 4 5725~5850MHz

## WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 151 5755MHz		5641.8	51.61	-16.59	68.2	39.82	32.4	6.25	26.86	100	326	P	H
		5675.4	52.29	-34.75	87.04	40.5	32.43	6.23	26.87	100	326	P	H
		5715.2	53.16	-56.3	109.46	41.37	32.46	6.22	26.89	100	326	P	H
		5724.4	53.68	-67.15	120.83	41.87	32.48	6.22	26.89	100	326	P	H
	*	5755	91.77	-	-	79.96	32.51	6.2	26.9	100	326	P	H
	*	5755	85.1	-	-	73.29	32.51	6.2	26.9	100	326	A	H
		5853	50.3	-65.06	115.36	38.37	32.58	6.29	26.94	100	326	P	H
		5870.4	50.73	-55.76	106.49	38.68	32.6	6.4	26.95	100	326	P	H
		5888.2	51.86	-43.54	95.4	39.74	32.68	6.4	26.96	100	326	P	H
		5930.6	51.48	-16.72	68.2	39.17	32.76	6.52	26.97	100	326	P	H
		5607.6	52.13	-16.07	68.2	40.32	32.39	6.27	26.85	105	45	P	V
		5687.8	52.91	-43.29	96.2	41.11	32.45	6.23	26.88	105	45	P	V
		5718.2	63.26	-47.04	110.3	51.45	32.48	6.22	26.89	105	45	P	V
		5723.8	67.26	-52.2	119.46	55.45	32.48	6.22	26.89	105	45	P	V
	*	5755	104.62	-	-	92.81	32.51	6.2	26.9	105	45	P	V
	*	5755	98.13	-	-	86.32	32.51	6.2	26.9	105	45	A	V
		5851.4	50.31	-68.7	119.01	38.38	32.58	6.29	26.94	105	45	P	V
		5873.4	51.4	-54.25	105.65	39.31	32.64	6.4	26.95	105	45	P	V
		5885	51.94	-45.83	97.77	39.86	32.64	6.4	26.96	105	45	P	V
		5935.6	50.96	-17.24	68.2	38.55	32.76	6.63	26.98	105	45	P	V



WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 159 5795MHz		5626.2	52.02	-16.18	68.2	40.23	32.39	6.25	26.85	100	327	P	H
		5668.2	51.41	-30.3	81.71	39.62	32.43	6.23	26.87	100	327	P	H
		5714.8	50.74	-58.61	109.35	38.95	32.46	6.22	26.89	100	327	P	H
		5722.8	50.94	-66.24	117.18	39.13	32.48	6.22	26.89	100	327	P	H
	*	5795	90.71	-	-	78.91	32.54	6.18	26.92	100	327	P	H
	*	5795	84.03	-	-	72.23	32.54	6.18	26.92	100	327	A	H
		5851	50.77	-69.15	119.92	38.84	32.58	6.29	26.94	100	327	P	H
		5869.4	51.39	-55.38	106.77	39.34	32.6	6.4	26.95	100	327	P	H
		5913.2	51.84	-25.06	76.9	39.57	32.72	6.52	26.97	100	327	P	H
		5933.2	51.57	-16.63	68.2	39.26	32.76	6.52	26.97	100	327	P	H
		5647.6	55.35	-12.85	68.2	43.56	32.4	6.25	26.86	104	44	P	V
		5695	51.54	-49.97	101.51	39.74	32.45	6.23	26.88	104	44	P	V
		5716.8	57.2	-52.71	109.91	45.41	32.46	6.22	26.89	104	44	P	V
		5721.8	52.69	-62.21	114.9	40.88	32.48	6.22	26.89	104	44	P	V
	*	5795	103.9	-	-	92.1	32.54	6.18	26.92	104	44	P	V
	*	5795	98.28	-	-	86.48	32.54	6.18	26.92	104	44	A	V
		5854	51.98	-61.1	113.08	40.03	32.6	6.29	26.94	104	44	P	V
		5856.4	51.64	-58.77	110.41	39.58	32.6	6.4	26.94	104	44	P	V
		5885.6	53.65	-43.68	97.33	41.57	32.64	6.4	26.96	104	44	P	V
		5934.6	52.39	-15.81	68.2	39.98	32.76	6.63	26.98	104	44	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**Band 4 5725~5850MHz**  
**WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11n HT40 CH 151 5755MHz		11510	50.15	-23.85	74	56.69	39.3	9.5	55.34	160	360	P	H
		17265	57.33	-10.87	68.2	55.62	43.26	14.97	56.52	170	360	P	H
		11510	49.79	-24.21	74	56.33	39.3	9.5	55.34	160	360	P	V
		17265	57.04	-11.16	68.2	55.33	43.26	14.97	56.52	170	360	P	V
802.11n HT40 CH 159 5795MHz		11590	50.35	-23.65	74	56.73	39.3	9.53	55.21	170	300	P	H
		17385	57.02	-11.18	68.2	54.4	44.03	15.2	56.61	150	200	P	H
		11590	49.9	-24.1	74	56.28	39.3	9.53	55.21	170	300	P	V
		17385	56.13	-12.07	68.2	53.51	44.03	15.2	56.61	150	200	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



## Band 4 5725~5850MHz

## WIFI 802.11ac VHT80 (Band Edge @ 3m)

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11ac VHT80 CH 155 5775MHz		5642.2	52.34	-15.86	68.2	40.55	32.4	6.25	26.86	100	326	P	H
		5668	51.48	-30.08	81.56	39.69	32.43	6.23	26.87	100	326	P	H
		5713.2	52.59	-56.31	108.9	40.8	32.46	6.22	26.89	100	326	P	H
		5720.4	51.35	-60.36	111.71	39.54	32.48	6.22	26.89	100	326	P	H
	*	5775	84.9	-	-	73.09	32.52	6.2	26.91	100	326	P	H
	*	5775	80.11	-	-	68.3	32.52	6.2	26.91	100	326	A	H
		5853.6	52.01	-61.98	113.99	40.06	32.6	6.29	26.94	100	326	P	H
		5863	51.4	-57.16	108.56	39.35	32.6	6.4	26.95	100	326	P	H
		5910.6	52.23	-26.59	78.82	39.96	32.72	6.52	26.97	100	326	P	H
		5938.6	52.02	-16.18	68.2	39.57	32.8	6.63	26.98	100	326	P	H
		5643.8	53.03	-15.17	68.2	41.24	32.4	6.25	26.86	100	45	P	V
		5700	54.95	-50.25	105.2	43.16	32.45	6.22	26.88	100	45	P	V
		5719	57.87	-52.65	110.52	46.06	32.48	6.22	26.89	100	45	P	V
		5724.2	57.72	-62.66	120.38	45.91	32.48	6.22	26.89	100	45	P	V
	*	5775	97.04	-	-	85.23	32.52	6.2	26.91	100	45	P	V
	*	5775	90.72	-	-	78.91	32.52	6.2	26.91	100	45	A	V
		5853.2	50.91	-63.99	114.9	38.98	32.58	6.29	26.94	100	45	P	V
		5867.2	53.39	-53.99	107.38	41.34	32.6	6.4	26.95	100	45	P	V
		5886.8	51.99	-44.45	96.44	39.91	32.64	6.4	26.96	100	45	P	V
		5939.6	51.24	-16.96	68.2	38.79	32.8	6.63	26.98	100	45	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

**Band 4 5725~5850MHz****WIFI 802.11ac VHT80 (Harmonic @ 3m)**

WIFI Ant. 1+2	Note	Frequency ( MHz )	Level ( dBμV/m )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB/m )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Peak Avg. ( P/A )	Pol. ( H/V )
802.11ac		11550	50.21	-23.79	74	56.65	39.3	9.52	55.26	160	360	P	H
VHT80		17325	55.61	-12.59	68.2	53.46	43.59	15.12	56.56	170	360	P	H
CH 155		11550	50.01	-23.99	74	56.45	39.3	9.52	55.26	160	360	P	V
5775MHz		17325	56.24	-11.96	68.2	54.09	43.59	15.12	56.56	170	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												





## Emission below 1GHz

## Emission below 1GHz

## 5GHz WIFI 802.11n HT20 (LF @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
5GHz 802.11n HT20 LF		30	23.48	-16.52	40	30.3	24.9	0.25	31.97	-	-	P	H
		127.97	17.84	-25.66	43.5	30.74	17.54	1.18	31.62	-	-	P	H
		263.77	21.5	-24.5	46	30.85	20.13	1.75	31.23	-	-	P	H
		500.45	26.92	-19.08	46	31.72	24	2.43	31.23	-	-	P	H
		697.36	29.83	-16.17	46	31.5	26.67	2.92	31.26	-	-	P	H
		948.59	33.66	-12.34	46	31.64	29.88	3.47	31.33	100	360	P	H
		30	24.27	-15.73	40	31.09	24.9	0.25	31.97	-	-	P	V
		60.07	25.11	-14.89	40	44.29	11.9	0.83	31.91	-	-	P	V
		260.86	21.43	-24.57	46	30.6	20.33	1.74	31.24	-	-	P	V
		461.65	25.48	-20.52	46	31.24	23.19	2.33	31.28	-	-	P	V
		720.64	29.78	-16.22	46	30.98	27.07	2.97	31.24	-	-	P	V
		954.41	33.15	-12.85	46	31.06	29.95	3.48	31.34	137	46	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

*	<b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is <b>over limit</b> line.
P/A	<b>P</b> eak or <b>A</b> verage
H/V	<b>H</b> orizontal or <b>V</b> ertical



A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

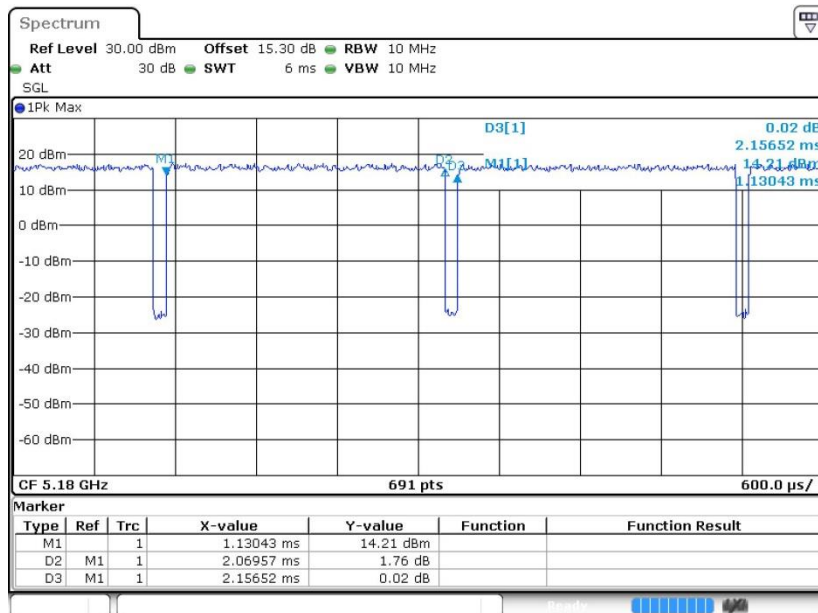
= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

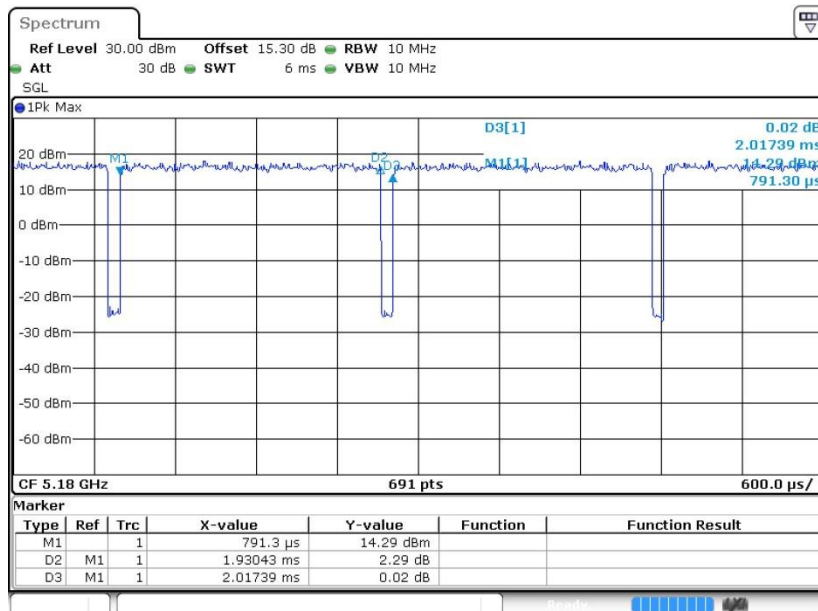
Both peak and average measured complies with the limit line, so test result is “PASS”.

## Appendix D. Duty Cycle Plots

Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2	802.11a	95.97	2.070	0.483	1kHz
1+2	802.11n HT20	95.69	1.930	0.518	1kHz
1+2	802.11n HT40	91.60	0.948	1.055	3kHz
1+2	802.11ac VHT80	84.03	0.465	2.150	3kHz

**Ant.1+2**
**802.11a**


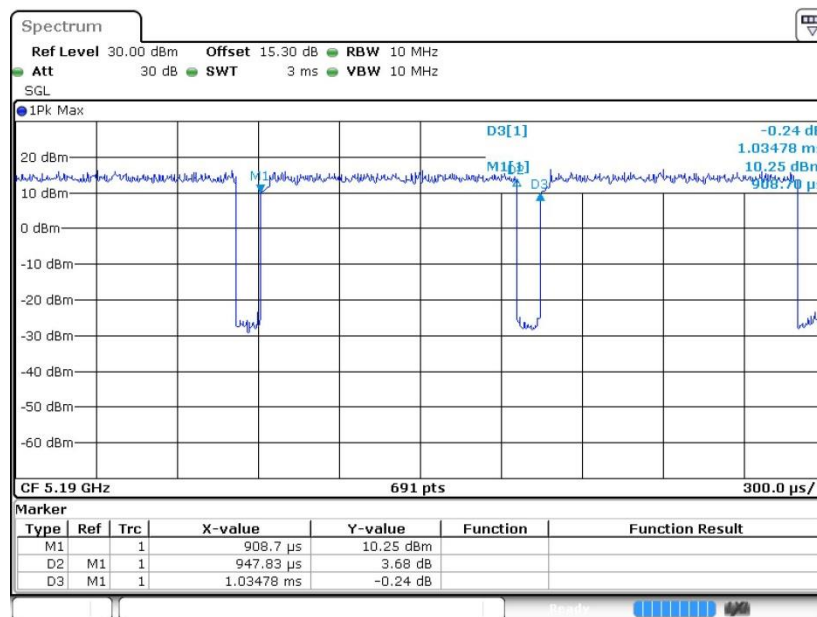
Date: 30.MAY.2018 19:32:18

**Ant.1+2**
**802.11n HT20**


Date: 30.MAY.2018 19:44:52

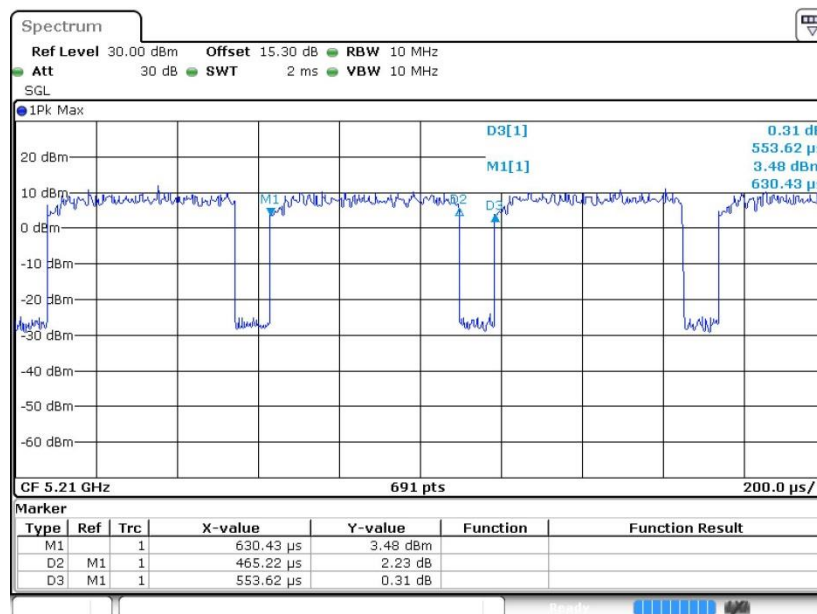


## 802.11n HT40



Date: 30.MAY.2018 20:02:04

## 802.11ac VHT80



Date: 30.MAY.2018 21:05:12