



# FCC RF Test Report

**APPLICANT** : TP-LINK TECHNOLOGIES CO., LTD.  
**EQUIPMENT** : AC1900 Wireless Dual Band Gigabit Access Point  
**BRAND NAME** : TP-LINK  
**MODEL NAME** : EAP330  
**FCC ID** : TE7EAP330  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure

The product was received on Apr. 05, 2016 and testing was completed on May 31, 2016. 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.

Prepared by: Ken Chen / Manager

Approved by: Jones Tsai / Manager



**SPORTON INTERNATIONAL (SHENZHEN) INC.**

**1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town,  
Nanshan District, Shenzhen, Guangdong, P. R. China**



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**SUMMARY OF TEST RESULT**

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	RSS-247 Section 6	6dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	RSS-247 Section 6	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	RSS-247 Section 6	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	RSS-247 Section 6	Unwanted Emissions	15.407(b)(4)(i) ≤ -17, -27 dBm/MHz &15.209(a)	Pass	Under limit 1.61 dB at 11490.000 MHz
3.5	15.207	RSS-Gen 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 3.06 dB at 0.450 MHz
3.6	15.407(g)	-	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	RSS-247 6.4(2)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	N/A	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

**TP-LINK TECHNOLOGIES CO., LTD.**

Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

## 1.2 Manufacturer

**TP-LINK TECHNOLOGIES CO., LTD.**

Building 24 (floors 1,3,4,5) and 28 (floors1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

## 1.3 Feature of Equipment Under Test

Product Feature & Specification	
<b>Equipment</b>	AC1900 Wireless Dual Band Gigabit Access Point
<b>Brand Name</b>	TP-LINK
<b>Model Name</b>	EAP330
<b>FCC ID</b>	TE7EAP330
<b>EUT supports Radios application</b>	WLAN2.4GHz 802.11b/g/n HT20/HT40/ WLAN2.4GHz 802.11ac VHT20/VHT40 WLAN5GHz 802.11a/n HT20/HT40/ WLAN5GHz 802.11ac VHT20/VHT40/VHT80
<b>EUT Stage</b>	Identical Prototype

**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

Product Specification subjective to this standard											
<b>Tx/Rx Channel Frequency Range</b>	5745 MHz ~ 5825 MHz										
<b>Maximum Output Power</b>	802.11a : 28.75 dBm / 0.7499 W 802.11n HT20 : 28.73 dBm / 0.7464 W 802.11n HT40 : 28.69 dBm / 0.7396 W 802.11ac VHT20: 28.69 dBm / 0.7396 W 802.11ac VHT40: 28.51 dBm / 0.7096 W 802.11ac VHT80: 28.56 dBm / 0.7178 W										
<b>99% Occupied Bandwidth</b>	802.11a : 18.40 MHz 802.11n HT20 : 19.30 MHz 802.11n HT40 : 37.10 MHz 802.11ac VHT20 : 19.50 MHz 802.11ac VHT40 : 37.30 MHz 802.11ac VHT80 : 76.08 MHz										
<b>Antenna Type / Gain</b>	Chain Port 1 : PIFA Antenna Chain Port 2 : PIFA Antenna Chain Port 3 : PIFA Antenna										
<b>Antenna Gain</b>	Chain Port 1 : 5.66 dBi Chain Port 2 : 7.20 dBi Chain Port 3 : 6.90 dBi										
<b>Type of Modulation</b>	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)										
<b>Antenna Function Description</b>	<table border="1"> <thead> <tr> <th></th> <th>Chain Port 1</th> <th>Chain Port 2</th> <th>Chain Port 3</th> </tr> </thead> <tbody> <tr> <td>802.11a/n/ac MIMO</td> <td>V</td> <td>V</td> <td>V</td> </tr> </tbody> </table>				Chain Port 1	Chain Port 2	Chain Port 3	802.11a/n/ac MIMO	V	V	V
	Chain Port 1	Chain Port 2	Chain Port 3								
802.11a/n/ac MIMO	V	V	V								



### 1.5 Modification of EUT

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

### 1.6 Testing Location

<b>Test Site</b>	SPORTON INTERNATIONAL (SHENZHEN) INC.	
<b>Test Site Location</b>	1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	TH01-SZ	CO01-SZ

<b>Test Site</b>	SPORTON INTERNATIONAL (SHENZHEN) INC.	
<b>Test Site Location</b>	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC/IC Registration No.</b>
	03CH03-SZ	565805/4086F

**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 v01r02
- 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

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: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

### 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
	<b>151</b>	<b>5755</b>	<b>159</b>	<b>5795</b>
	153	5765	161	5805
	155	5775	165	5825

**Note:** The above Frequency and Channel in boldface were 802.11n HT40.





### 2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in the following tables. Final Output Power equals to Measured Output Power adds the duty factor.

WLAN 5GHz 802.11a Average Power (dBm)											
Power vs. Channel				Power vs. Data Rate							
Channel	Frequency (MHz)	Chain Port	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
			6Mbps								
CH 149	5745	1+2+3	28.75	CH 149	28.72	28.70	28.67	28.66	28.65	28.70	28.67
CH 157	5785	1+2+3	28.51								
CH 165	5825	1+2+3	28.66								

WLAN 5GHz 802.11n-HT20 Average Power (dBm)											
Power vs. Channel				Power vs. Data Rate							
Channel	Frequency (MHz)	Chain Port	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
			MCS0								
CH 149	5745	1+2+3	28.73	CH 149	28.66	28.67	28.64	28.68	28.67	28.69	28.70
CH 157	5785	1+2+3	28.47								
CH 165	5825	1+2+3	28.60								

WLAN 5GHz 802.11n-HT40 Average Power (dBm)											
Power vs. Channel				Power vs. Data Rate							
Channel	Frequency (MHz)	Chain Port	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
			MCS0								
CH 151	5755	1+2+3	28.52	CH 159	28.63	28.63	28.56	28.65	28.65	28.65	28.65
CH 159	5795	1+2+3	28.69								

WLAN 5GHz 802.11ac VHT20 Average Power (dBm)												
Power vs. Channel				Power vs. Data Rate								
Channel	Frequency (MHz)	Chain Port	MCS Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8
			MCS0									
CH 149	5745	1+2+3	28.69	CH 149	28.62	28.65	28.66	28.66	28.64	28.64	28.62	28.63
CH 157	5785	1+2+3	28.46									
CH 165	5825	1+2+3	28.59									



WLAN 5GHz 802.11ac VHT40 Average Power (dBm)													
Power vs. Channel				Power vs. Data Rate									
Channel	Frequency (MHz)	Chain Port	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 151	5755	1+2+3	28.42	CH 159	28.46	28.43	28.40	28.43	28.46	28.40	28.41	28.43	28.44
CH 159	5795	1+2+3	28.51										

WLAN 5GHz 802.11n-HT80 Average Power (dBm)													
Power vs. Channel				Power vs. Data Rate									
Channel	Frequency (MHz)	Chain Port	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
CH 155	5775	1+2+3	28.56	CH 155	28.51	28.50	28.51	28.51	28.50	28.49	28.52	28.53	28.53

**Note:** Chain Port 1+2+3 is a calculated result from sum of the power Chain Port 1+2+3(1), Chain Port 1+2+3(2) and Chain Port 1+2+3(3).



### 2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

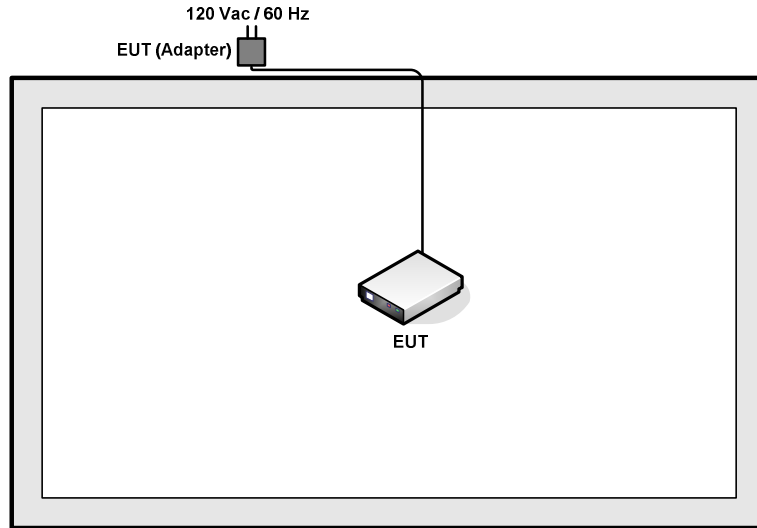
<b>AC Conducted Emission</b>	Mode 1 : WLAN (5G) Link + Data Link (POE port) + Data Link (LAN port) + Adapter
<b>Remark:</b>	
1. For Radiated TCs, the tests were performed with adapter.	

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

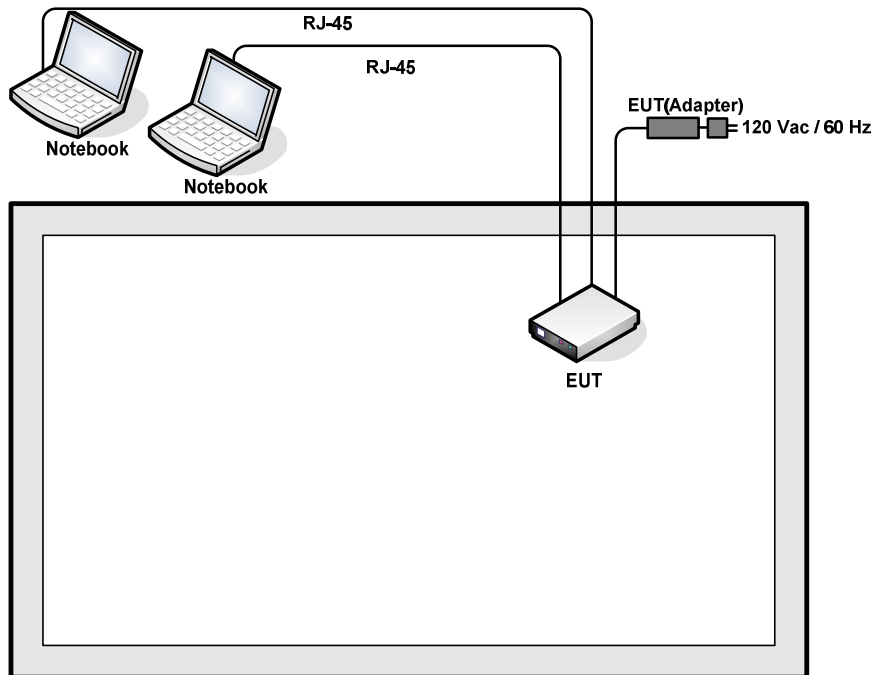
Ch. #		Band IV : 5725-5850 MHz		
		802.11ac VHT20	802.11ac VHT40	802.11ac VHT80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

## 2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>





## 2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	Dell	Vostro1440	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

## 2.6 EUT Operation Test Setup

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

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

## 2.7 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 6.5 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 6.5 + 10 = 16.5 \text{ (dB)} \end{aligned}$$

### 3 Test Result

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

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

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

99% Occupied bandwidth are reporting only.

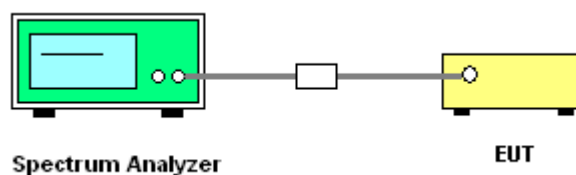
##### 3.1.2 Measuring Instruments

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 v01r02.  
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.

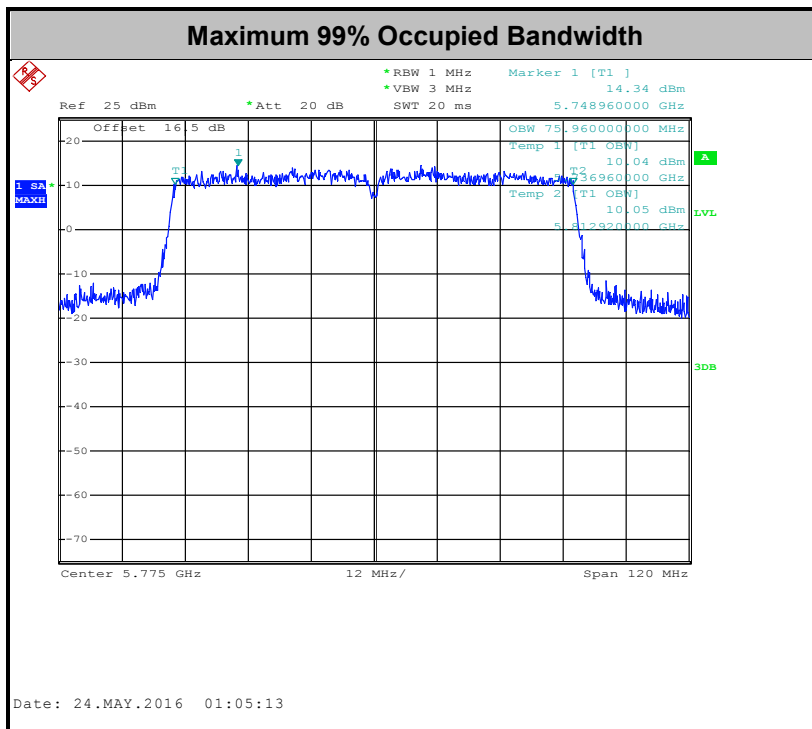
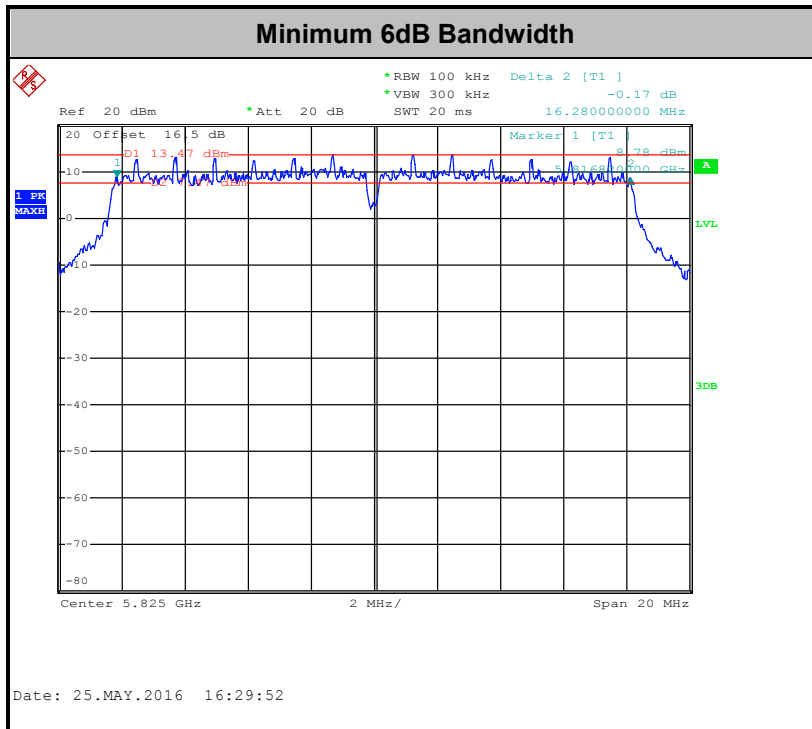
##### 3.1.4 Test Setup





### 3.1.5 Test Result of 6dB and 99% Occupied 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 an indoor access point operating in the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1W.

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.

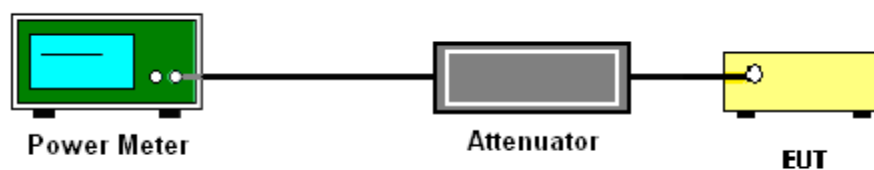
### 3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r02.

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 v01r02. 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).

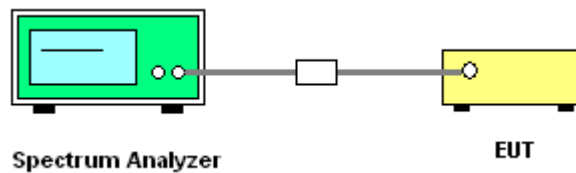
1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r02.
  - Measure the duty cycle.
  - Set span to encompass the entire emission bandwidth (EBW) of the signal.
  - Set RBW = 300 kHz.
  - Set VBW  $\geq$  1 MHz.
  - Number of points in sweep  $\geq$  2 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.

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

Method (a): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

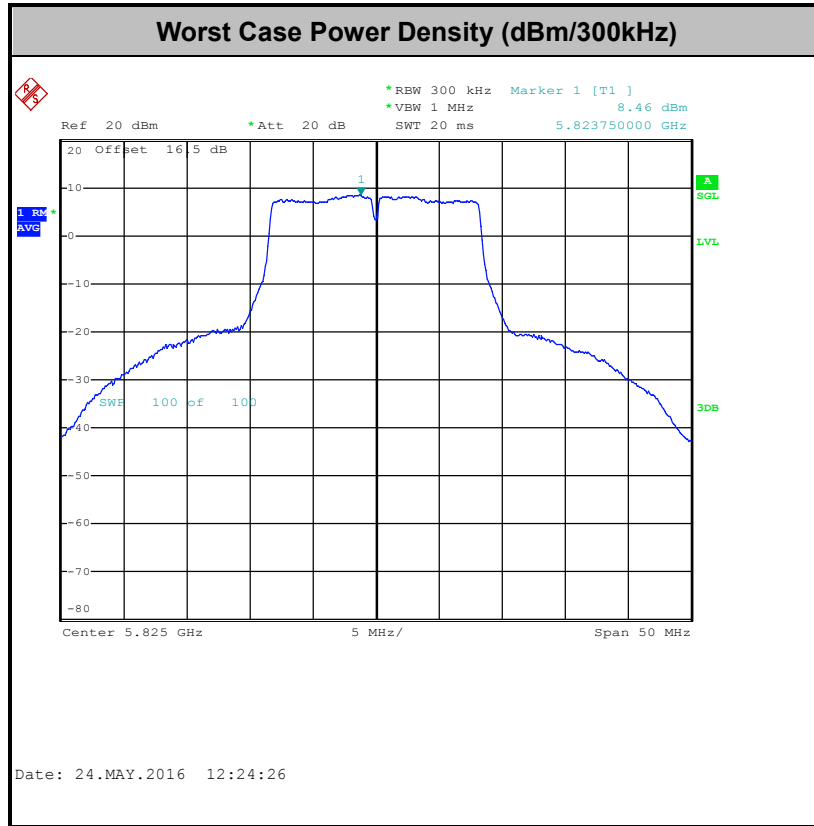
### 3.3.4 Test Setup





### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.





### 3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

#### 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) For transmitters operating in the 5725-5850 MHz band:  
all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBµV/m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBµV/m).
- (3) Unwanted spurious emissions fallen in restricted bands per FCC Part15.205 shall comply with the general field strength limits set forth in § 15.209 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.

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

EIRP (dBm)	Field Strength at 3m (dBµV/m)
-17	78.3
- 27	68.3



- (4) KDB 789033 D02 General UNII Test Procedures New Rules v01r02 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.



### **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 v01r02. 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

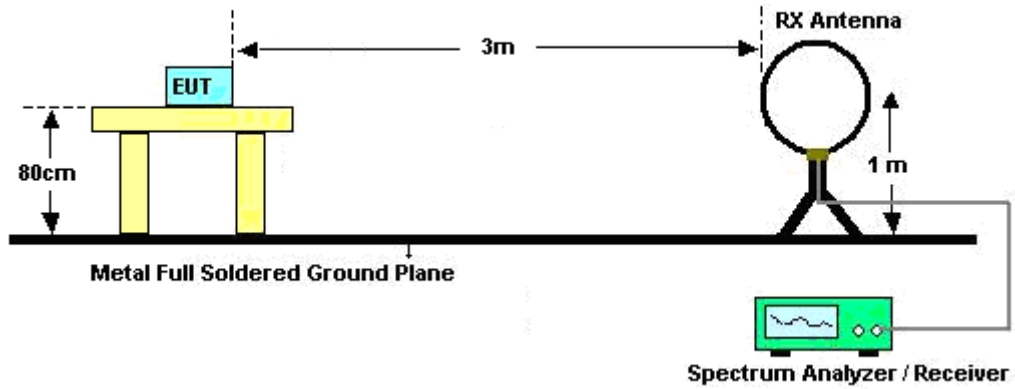
- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.



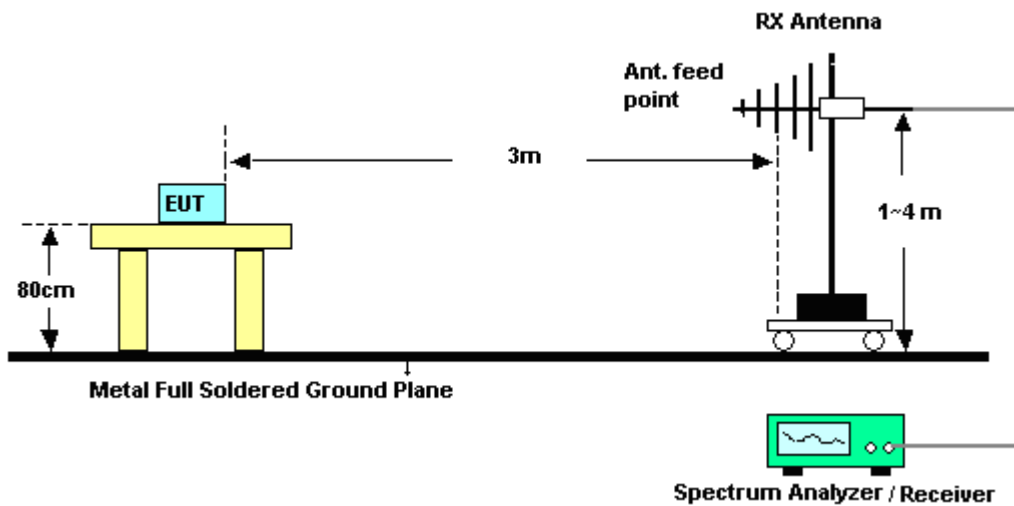
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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

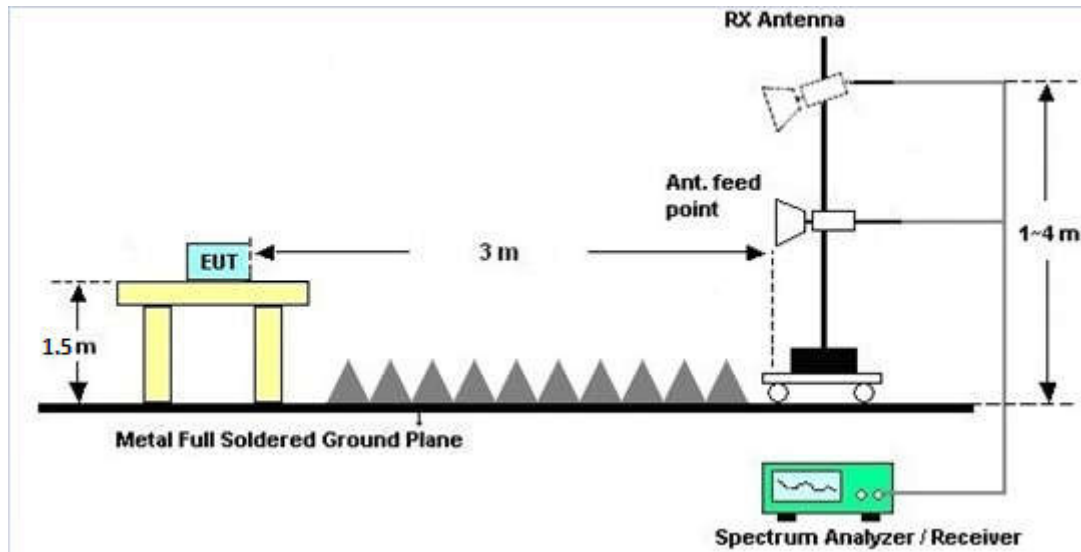


For radiated emissions from 30MHz to 1GHz





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 per 15.31(o) was not reported.

### 3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix B.

### 3.4.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.



### 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 (dB $\mu$ V)	
	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.

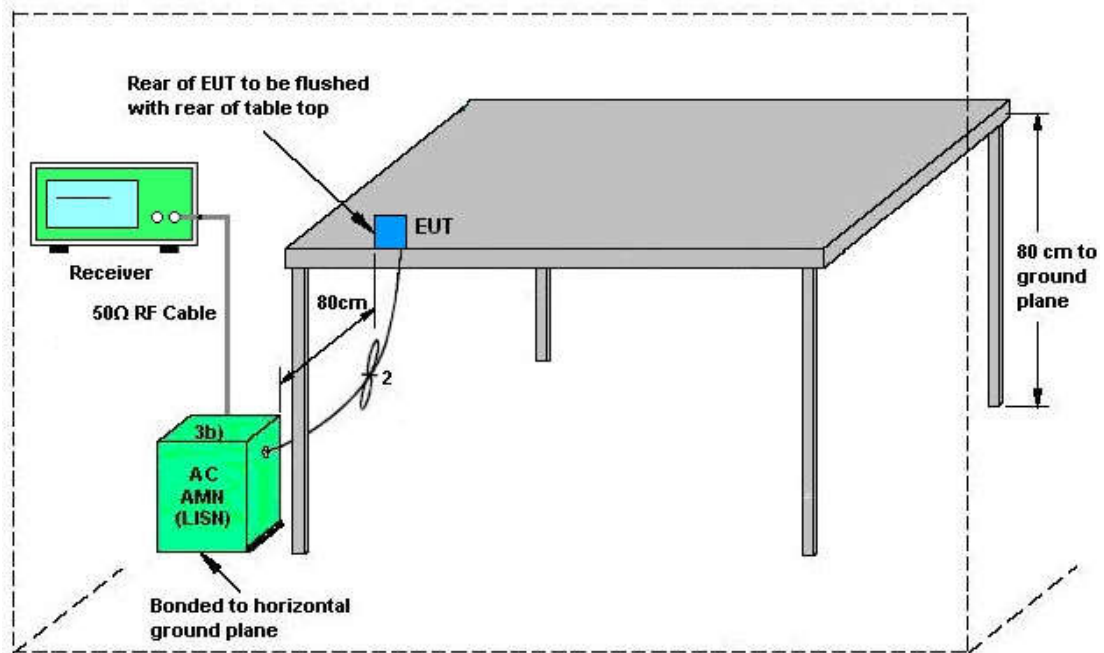
#### 3.5.2 Measuring Instruments

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

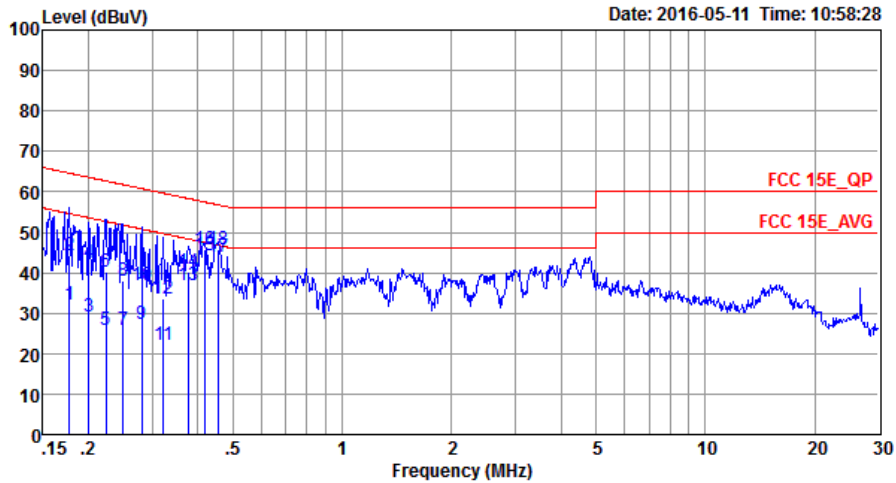


AMN = Artificial mains network (LISN)  
AE = Associated equipment  
EUT = Equipment under test  
ISN = Impedance stabilization network



3.5.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Tao Cheng	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	WLAN (5G) Link + Data Link (POE port) + Data Link (LAN port) + Adapter		

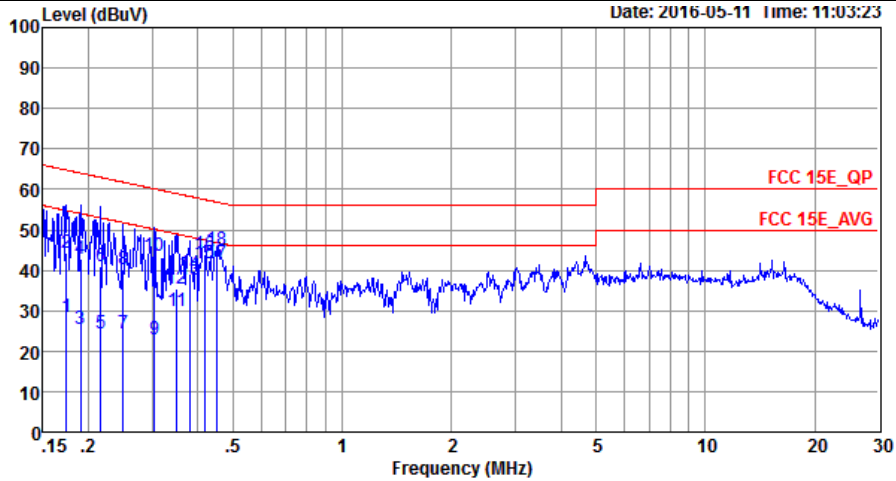


Site : CO01-SZ  
 Condition: FCC 15E\_QP LISN\_20160509 LINE  
 Mode : Mode 1

	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.18	31.96	-22.63	54.59	21.30	0.12	10.54	Average
2	0.18	44.26	-20.33	64.59	33.60	0.12	10.54	QP
3	0.20	29.21	-24.37	53.58	18.60	0.11	10.50	Average
4	0.20	42.31	-21.27	63.58	31.70	0.11	10.50	QP
5	0.22	25.79	-26.91	52.70	15.20	0.11	10.48	Average
6	0.22	40.29	-22.41	62.70	29.70	0.11	10.48	QP
7	0.25	25.67	-26.11	51.78	15.10	0.11	10.46	Average
8	0.25	38.07	-23.71	61.78	27.50	0.11	10.46	QP
9	0.28	27.14	-23.67	50.81	16.60	0.11	10.43	Average
10	0.28	36.74	-24.07	60.81	26.20	0.11	10.43	QP
11	0.32	21.99	-27.67	49.66	11.50	0.11	10.38	Average
12	0.32	33.69	-25.97	59.66	23.20	0.11	10.38	QP
13	0.38	36.99	-11.35	48.34	26.60	0.11	10.28	Average
14	0.38	40.19	-18.15	58.34	29.80	0.11	10.28	QP
15	0.42	44.15	-3.36	47.51	33.80	0.11	10.24	Average
16	0.42	45.65	-11.86	57.51	35.30	0.11	10.24	QP
17 *	0.45	43.74	-3.06	46.80	33.40	0.11	10.23	Average
18	0.45	45.64	-11.16	56.80	35.30	0.11	10.23	QP



Test Mode :	Mode 1	Temperature :	21~23°C
Test Engineer :	Tao Cheng	Relative Humidity :	41~42%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	WLAN (5G) Link + Data Link (POE port) + Data Link (LAN port) + Adapter		



Site : CO01-SZ  
 Condition: FCC 15E\_QP LISN\_20160509 NEUTRAL  
 Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.17	28.57	-26.20	54.77	17.90	0.12	10.55	Average
2	0.17	44.37	-20.40	64.77	33.70	0.12	10.55	QP
3	0.19	25.53	-28.49	54.02	14.89	0.12	10.52	Average
4	0.19	42.93	-21.09	64.02	32.29	0.12	10.52	QP
5	0.22	24.39	-28.57	52.96	13.80	0.11	10.48	Average
6	0.22	40.89	-22.07	62.96	30.30	0.11	10.48	QP
7	0.25	24.37	-27.41	51.78	13.80	0.11	10.46	Average
8	0.25	40.17	-21.61	61.78	29.60	0.11	10.46	QP
9	0.30	23.02	-27.13	50.15	12.50	0.11	10.41	Average
10	0.30	43.72	-16.43	60.15	33.20	0.11	10.41	QP
11	0.35	29.84	-19.12	48.96	19.40	0.11	10.33	Average
12	0.35	35.54	-23.42	58.96	25.10	0.11	10.33	QP
13	0.38	37.69	-10.61	48.30	27.30	0.11	10.28	Average
14	0.38	39.29	-19.01	58.30	28.90	0.11	10.28	QP
15	0.42	41.85	-5.66	47.51	31.50	0.11	10.24	Average
16	0.42	43.75	-13.76	57.51	33.40	0.11	10.24	QP
17 *	0.45	41.74	-5.11	46.85	31.40	0.11	10.23	Average
18	0.45	45.14	-11.71	56.85	34.80	0.11	10.23	QP

## 3.6 Frequency Stability Measurement

### 3.6.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

### 3.6.2 Measuring Instruments

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

### 3.6.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

### 3.6.4 Test Setup



### 3.6.5 Test Result of Frequency Stability

Please refer to Appendix A.



## **3.7 Automatically Discontinue Transmission**

### **3.7.1 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.

### **3.7.2 Measuring Instruments**

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

### **3.7.3 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.



### 3.8 Antenna Requirements

#### 3.8.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,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.

#### 3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

#### 3.8.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain =  $G_{ANT}$  + Array Gain, where Array Gain is as follows.

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

Array Gain =  $10 \log(N_{ANT}/N_{SS}=1)$  dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ .

The EUT supports CDD mode.

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.

5.8G Band Antenna	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
1	5.66	5.66	0.00	0.00
2	7.20	7.20	1.20	1.20
3	6.90	6.90	0.90	0.90
1+2	7.20	9.47	1.20	3.47
1+3	6.90	9.31	0.90	3.31
2+3	7.20	10.06	1.20	4.06
1+2+3	7.20	11.38	1.20	5.38

Power limit reduction = Composite gain – 6dBi, ( min = 0 )

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, ( min = 0 )





## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP30	101400	9kHz~40GHz	Jan. 12, 2016	May 24, 2016~ May 25, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 12, 2016	May 24, 2016~ May 25, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 12, 2016	May 24, 2016~ May 25, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Thermal Chamber	Ten Billion Hongzhangroup	LP-150U	H2014081803	-40~+150°C	Aug. 07, 2015	May 24, 2016~ May 25, 2016	Aug. 06, 2016	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	May 07, 2016	May 31, 2016	May 06, 2017	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	May 07, 2016	May 31, 2016	May 06, 2017	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	May 31, 2016	May 06, 2017	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	May 21, 2016	May 31, 2016	May 20, 2017	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2016	May 31, 2016	May 06, 2017	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 19, 2015	May 31, 2016	Aug. 18, 2016	Radiation (03CH03-SZ)
Amplifier	PREAMPLIFIER	BPA-530	102210	0.01Hz~3000MHz	Oct. 20, 2015	May 31, 2016	Oct. 19, 2016	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 12, 2016	May 31, 2016	Jan. 11, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 18, 2015	May 31, 2016	Jul. 17, 2016	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	May 31, 2016	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	May 31, 2016	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	May 31, 2016	NCR	Radiation (03CH03-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz; Max 30dBm	Oct. 20, 2015	May 11, 2016	Oct. 19, 2016	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103892	9kHz~30MHz	Jan.12, 2016	May 11, 2016	Jan. 11, 2017	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103912	9kHz~30MHz	Jan. 12, 2016	May 11, 2016	Jan. 11, 2017	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Aug. 07, 2015	May 11, 2016	Aug. 06, 2016	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% ( $U = 2Uc(y)$ )	2.3 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0 dB
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### Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.8dB
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### Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.0dB
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## **Appendix A. Conducted Test Results**

Test Engineer:	Mygai Mo	Temperature:	24~26	°C
Test Date:	2016/5/24~ 2016/5/25	Relative Humidity:	50~53	%

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

Band IV														
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)			6 dB Bandwidth (MHz)			6 dB Bandwidth Min. Limit (MHz)			Pass/Fail
					Ant 1	Ant 2	Ant 3	Ant 1	Ant 2	Ant 3	Ant 1	Ant 2	Ant 3	
11a	6Mbps	3	149	5745	18.20	18.15	18.1	16.32	16.36	16.36	0.5			Pass
11a	6Mbps	3	157	5785	18.40	18.10	18.05	16.32	16.30	16.36	0.5			Pass
11a	6Mbps	3	165	5825	18.40	18.20	18.25	16.28	16.32	16.36	0.5			Pass
HT20	MCS0	3	149	5745	19.30	18.85	18.75	17.56	17.56	17.56	0.5			Pass
HT20	MCS0	3	157	5785	19.25	18.80	19.25	17.54	17.56	17.56	0.5			Pass
HT20	MCS0	3	165	5825	18.95	19.20	19.05	17.56	17.56	17.56	0.5			Pass
HT40	MCS0	3	151	5755	37.10	36.90	36.9	36.32	36.36	36.26	0.5			Pass
HT40	MCS0	3	159	5795	37.10	36.90	36.9	36.28	36.32	36.34	0.5			Pass
VHT20	MCS0	3	149	5745	19.50	19.45	18.85	17.56	17.58	17.6	0.5			Pass
VHT20	MCS0	3	157	5785	19.20	18.75	18.75	17.56	17.58	17.56	0.5			Pass
VHT20	MCS0	3	165	5825	19.35	18.85	19	17.56	17.62	17.56	0.5			Pass
VHT40	MCS0	3	151	5755	37.30	36.90	36.9	36.32	36.36	36.34	0.5			Pass
VHT40	MCS0	3	159	5795	37.00	36.70	36.8	36.32	36.36	36.34	0.5			Pass
VHT80	MCS0	3	155	5775	76.08	75.96	75.84	75.84	76.40	75.68	0.5			Pass

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

Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)				FCC Conducted Power Limit (dBm)			DG (dBi)			Pass/Fail
					Ant 1	Ant 2	Ant 3	SUM	Ant 1	Ant 2	Ant 3	Ant 1	Ant 2	Ant 3	
11a	6Mbps	3	149	5745	24.40	23.60	23.88	28.75	28.80			7.20			Pass
11a	6Mbps	3	157	5785	24.20	23.42	23.55	28.51	28.80			7.20			Pass
11a	6Mbps	3	165	5825	24.32	23.54	23.77	28.66	28.80			7.20			Pass
HT20	MCS0	3	149	5745	24.35	23.61	23.89	28.73	28.80			7.20			Pass
HT20	MCS0	3	157	5785	24.14	23.34	23.59	28.47	28.80			7.20			Pass
HT20	MCS0	3	165	5825	24.22	23.46	23.78	28.60	28.80			7.20			Pass
HT40	MCS0	3	151	5755	24.23	23.35	23.63	28.52	28.80			7.20			Pass
HT40	MCS0	3	159	5795	24.34	23.53	23.83	28.69	28.80			7.20			Pass
VHT20	MCS0	3	149	5745	24.37	23.51	23.83	28.69	28.80			7.20			Pass
VHT20	MCS0	3	157	5785	24.09	23.32	23.62	28.46	28.80			7.20			Pass
VHT20	MCS0	3	165	5825	24.26	23.42	23.71	28.59	28.80			7.20			Pass
VHT40	MCS0	3	151	5755	23.97	23.35	23.59	28.42	28.80			7.20			Pass
VHT40	MCS0	3	159	5795	24.06	23.47	23.66	28.51	28.80			7.20			Pass
VHT80	MCS0	3	155	5775	24.23	23.44	23.64	28.56	28.80			7.20			Pass

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

FCC Band IV															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Power Density with RBW and duty factor (dBm/500kHz)				Average PSD Limit (dBm/500kHz)			DG (dBi)			Pass /Fail
					Ant 1	Ant 2	Ant 3	SUM	Ant 1	Ant 2	Ant 3	Ant 1	Ant 2	Ant 3	
11a	6Mbps	3	149	5745	10.58	10.17	10.61	15.38	24.62			11.38			Pass
11a	6Mbps	3	157	5785	10.80	10.09	10.08	15.57	24.62			11.38			Pass
11a	6Mbps	3	165	5825	10.91	10.17	10.22	15.68	24.62			11.38			Pass
HT20	MCS0	3	149	5745	10.50	9.78	9.88	15.27	24.62			11.38			Pass
HT20	MCS0	3	157	5785	10.53	9.87	9.71	15.30	24.62			11.38			Pass
HT20	MCS0	3	165	5825	10.64	9.62	9.80	15.41	24.62			11.38			Pass
HT40	MCS0	3	151	5755	7.58	7.05	7.02	12.35	24.62			11.38			Pass
HT40	MCS0	3	159	5795	7.60	7.01	7.08	12.37	24.62			11.38			Pass
VHT20	MCS0	3	149	5745	10.58	9.76	9.86	15.35	24.62			11.38			Pass
VHT20	MCS0	3	157	5785	10.31	9.76	9.70	15.08	24.62			11.38			Pass
VHT20	MCS0	3	165	5825	10.65	9.99	9.82	15.42	24.62			11.38			Pass
VHT40	MCS0	3	151	5755	7.26	6.80	7.07	12.03	24.62			11.38			Pass
VHT40	MCS0	3	159	5795	7.42	6.85	6.94	12.19	24.62			11.38			Pass
VHT80	MCS0	3	155	5775	4.73	3.56	3.91	9.50	24.62			11.38			Pass

**TEST RESULTS DATA**  
**Frequency Stability**

Band IV										
Mod.	Data Rate	N <sub>TX</sub>	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stability (ppm)	Temperature (°C)	Voltage (V)	Note
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	20	90	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	20	264	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	20	120	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	-30	120	
11a	6Mbps	1	149	5745	5744.950	-0.050	-8.70	50	120	





# Appendix B. Radiated Spurious Emission

## Band 4 - 5725~5850MHz

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

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+3		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
802.11a CH 149 5745MHz		5627.6	58.73	-9.57	68.3	52.76	32.19	7.27	33.49	175	224	P	H
		5667.4	67.62	-13.59	81.21	61.52	32.28	7.32	33.5	175	224	P	H
		5719.8	85.8	-25.04	110.84	79.6	32.36	7.36	33.52	175	224	P	H
		5725	92.35	-29.95	122.3	86.15	32.36	7.36	33.52	175	224	P	H
		5745	120.68	-	-	114.41	32.39	7.41	33.53	175	224	P	H
		5745	112.49	-	-	106.22	32.39	7.41	33.53	175	224	A	H
		5616.6	53.2	-15.1	68.3	47.23	32.19	7.27	33.49	150	192	P	V
		5665.4	60.83	-18.9	79.73	54.76	32.25	7.32	33.5	150	192	P	V
		5713.4	66.77	-42.28	109.05	60.6	32.33	7.36	33.52	150	192	P	V
		5724.8	76.76	-45.08	121.84	70.56	32.36	7.36	33.52	150	192	P	V
		5745	116.27	-	-	110	32.39	7.41	33.53	150	192	P	V
		5745	108.57	-	-	102.3	32.39	7.41	33.53	150	192	A	V
802.11a CH 157 5785MHz		5627	60.17	-8.13	68.3	54.2	32.19	7.27	33.49	196	194	P	H
		5696.8	59.5	-43.44	102.94	53.35	32.3	7.36	33.51	196	194	P	H
		5706.2	62.82	-44.22	107.04	56.65	32.33	7.36	33.52	196	194	P	H
		5724.2	54.58	-65.9	120.48	48.38	32.36	7.36	33.52	196	194	P	H
		5785	117.72	-	-	111.37	32.44	7.45	33.54	196	194	P	H
		5785	109.22	-	-	102.87	32.44	7.45	33.54	196	194	A	H
		5852.4	53.79	-63.04	116.83	47.29	32.55	7.51	33.56	196	194	P	H
		5857.4	61.58	-48.65	110.23	55.05	32.58	7.51	33.56	196	194	P	H
		5877.8	55.08	-48.14	103.22	48.52	32.61	7.51	33.56	196	194	P	H
		5948.2	59.49	-8.81	68.3	52.79	32.72	7.56	33.58	196	194	P	H
		5625.8	60.81	-7.49	68.3	54.84	32.19	7.27	33.49	230	185	P	V
		5697.2	58.26	-44.98	103.24	52.11	32.3	7.36	33.51	230	185	P	V
		5705.6	61.77	-45.1	106.87	55.6	32.33	7.36	33.52	230	185	P	V
		5721.6	54.04	-60.51	114.55	47.84	32.36	7.36	33.52	230	185	P	V
	5785	117.57	-	-	111.22	32.44	7.45	33.54	230	185	P	V	



		5785	109.75	-	-	103.4	32.44	7.45	33.54	230	185	A	V
		5852.6	53.3	-63.07	116.37	46.8	32.55	7.51	33.56	230	185	P	V
		5865.8	60.8	-47.07	107.87	54.27	32.58	7.51	33.56	230	185	P	V
		5902.8	53.69	-31	84.69	47.1	32.63	7.53	33.57	230	185	P	V
		5946.6	56.34	-11.96	68.3	49.64	32.72	7.56	33.58	230	185	P	V
<b>802.11a CH 165 5825MHz</b>		5825	120.41	-	-	113.96	32.52	7.48	33.55	208	227	P	H
		5825	112.71	-	-	106.26	32.52	7.48	33.55	208	227	A	H
		5850.2	75.69	-46.15	121.84	69.19	32.55	7.51	33.56	208	227	P	H
		5857.4	74.24	-35.99	110.23	67.71	32.58	7.51	33.56	208	227	P	H
		5907.2	68.19	-13.25	81.44	61.57	32.66	7.53	33.57	208	227	P	H
		5947.6	59.25	-9.05	68.3	52.55	32.72	7.56	33.58	208	227	P	H
		5825	118.16	-	-	111.71	32.52	7.48	33.55	227	184	P	V
		5825	109.75	-	-	103.3	32.52	7.48	33.55	227	184	A	V
		5850	73.39	-48.91	122.3	66.89	32.55	7.51	33.56	227	184	P	V
		5855.6	66.34	-44.39	110.73	59.81	32.58	7.51	33.56	227	184	P	V
		5898	60.23	-28.01	88.24	53.64	32.63	7.53	33.57	227	184	P	V
		5937.8	50.71	-17.59	68.3	44.04	32.69	7.56	33.58	227	184	P	V
<b>Remark</b>	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+3	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 )
<b>802.11a</b> <b>CH 149</b> <b>5745MHz</b>		11490	54.64	-19.36	74	64.28	39.06	11.05	59.75	250	256	P	H
		11490	42.81	-11.19	54	52.45	39.06	11.05	59.75	250	256	A	H
		17235	50.39	-17.91	68.3	52.6	41.39	14.65	58.25	150	0	P	H
		11490	66.06	-7.94	74	75.7	39.06	11.05	59.75	250	332	P	V
		11490	52.39	-1.61	54	62.03	39.06	11.05	59.75	250	332	A	V
		17235	50.37	-17.93	68.3	52.58	41.39	14.65	58.25	150	0	P	V
<b>802.11a</b> <b>CH 157</b> <b>5785MHz</b>		11570	50.67	-23.33	74	60.51	38.98	11.01	59.83	250	0	P	H
		17355	50.6	-17.7	68.3	51.44	42.18	14.78	57.8	150	0	P	H
		11570	64.07	-9.93	74	73.91	38.98	11.01	59.83	250	325	P	V
		11570	51.69	-2.31	54	61.53	38.98	11.01	59.83	250	325	A	V
		17355	50.96	-17.34	68.3	51.8	42.18	14.78	57.8	150	0	P	V
<b>802.11a</b> <b>CH 165</b> <b>5825MHz</b>		11650	48.87	-25.13	74	58.88	38.92	10.97	59.9	250	0	P	H
		17475	50.43	-17.87	68.3	49.9	42.98	14.9	57.35	150	0	P	H
		11650	62.36	-11.64	74	72.37	38.92	10.97	59.9	188	298	P	V
		11650	50.64	-3.36	54	60.65	38.92	10.97	59.9	188	298	A	V
		17475	50.62	-17.68	68.3	50.09	42.98	14.9	57.35	150	0	P	V
<b>Remark</b>	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+3	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		5618.4	58.3	-10	68.3	52.33	32.19	7.27	33.49	182	221	P	H
		5662.8	65.67	-12.13	77.8	59.6	32.25	7.32	33.5	182	221	P	H
		5719.6	78.14	-32.65	110.79	71.94	32.36	7.36	33.52	182	221	P	H
		5724.8	90.34	-31.5	121.84	84.14	32.36	7.36	33.52	182	221	P	H
		5745	118.69	-	-	112.42	32.39	7.41	33.53	182	221	P	H
		5745	110.72	-	-	104.45	32.39	7.41	33.53	182	221	A	H
		5627.8	54.01	-14.29	68.3	48.04	32.19	7.27	33.49	150	106	P	V
		5661.6	59.97	-16.94	76.91	53.9	32.25	7.32	33.5	150	106	P	V
		5720	74.29	-36.61	110.9	68.09	32.36	7.36	33.52	150	106	P	V
		5721.2	83.87	-29.77	113.64	77.67	32.36	7.36	33.52	150	106	P	V
		5745	116.18	-	-	109.91	32.39	7.41	33.53	150	106	P	V
		5745	106.96	-	-	100.69	32.39	7.41	33.53	150	106	A	V
802.11n HT20 CH 157 5785MHz		5623	62.96	-5.34	68.3	56.99	32.19	7.27	33.49	181	218	P	H
		5698.2	64.37	-39.6	103.97	58.22	32.3	7.36	33.51	181	218	P	H
		5703.6	64.89	-41.42	106.31	58.71	32.33	7.36	33.51	181	218	P	H
		5721.2	57.47	-56.17	113.64	51.27	32.36	7.36	33.52	181	218	P	H
		5785	120.19	-	-	113.84	32.44	7.45	33.54	181	218	P	H
		5785	118.91	-	-	112.56	32.44	7.45	33.54	181	218	A	H
		5851	59.45	-60.57	120.02	52.95	32.55	7.51	33.56	181	218	P	H
		5868.6	66.59	-40.5	107.09	60.06	32.58	7.51	33.56	181	218	P	H
		5903.8	58.32	-25.63	83.95	51.73	32.63	7.53	33.57	181	218	P	H
		5943.6	64.93	-3.37	68.3	58.23	32.72	7.56	33.58	181	218	P	H
		5620	57.37	-10.93	68.3	51.4	32.19	7.27	33.49	150	168	P	V
		5699.8	57.4	-47.75	105.15	51.25	32.3	7.36	33.51	150	168	P	V
		5706.6	58.2	-48.95	107.15	52.03	32.33	7.36	33.52	150	168	P	V
		5724.2	52.83	-67.65	120.48	46.63	32.36	7.36	33.52	150	168	P	V
		5785	116.68	-	-	110.33	32.44	7.45	33.54	150	168	P	V
		5785	107.45	-	-	101.1	32.44	7.45	33.54	150	168	A	V
	5852.8	54.09	-61.83	115.92	47.59	32.55	7.51	33.56	150	168	P	V	
	5861	59.31	-49.91	109.22	52.78	32.58	7.51	33.56	150	168	P	V	



		5911.6	52.11	-26.08	78.19	45.5	32.66	7.53	33.58	150	168	P	V
		5941.2	55.88	-12.42	68.3	49.18	32.72	7.56	33.58	150	168	P	V
<b>802.11n HT20 CH 165 5825MHz</b>		5825	119.28	-	-	112.83	32.52	7.48	33.55	150	216	P	H
		5825	110.03	-	-	103.58	32.52	7.48	33.55	150	216	A	H
		5850.6	82.57	-38.36	120.93	76.07	32.55	7.51	33.56	150	216	P	H
		5857.8	75.24	-34.87	110.11	68.71	32.58	7.51	33.56	150	216	P	H
		5903.2	66.17	-18.22	84.39	59.58	32.63	7.53	33.57	150	216	P	H
		5943.6	57.54	-10.76	68.3	50.84	32.72	7.56	33.58	150	216	P	H
		5825	116.05	-	-	109.6	32.52	7.48	33.55	150	185	P	V
		5825	107.45	-	-	101	32.52	7.48	33.55	150	185	A	V
		5850.2	66.48	-55.36	121.84	59.98	32.55	7.51	33.56	150	185	P	V
		5855.2	63.77	-47.07	110.84	57.24	32.58	7.51	33.56	150	185	P	V
		5904	60.22	-23.58	83.8	53.63	32.63	7.53	33.57	150	185	P	V
		5943	51.32	-16.98	68.3	44.62	32.72	7.56	33.58	150	185	P	V
<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>												



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

WIFI Ant. 1+2+3	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	52.76	-21.24	74	62.4	39.06	11.05	59.75	250	321	P	H
		11490	42.5	-11.5	54	52.14	39.06	11.05	59.75	250	321	A	H
		17235	50.22	-18.08	68.3	52.43	41.39	14.65	58.25	150	0	P	H
		11490	63.94	-10.06	74	73.58	39.06	11.05	59.75	240	351	P	V
		11490	50.95	-3.05	54	60.59	39.06	11.05	59.75	240	351	A	V
		17235	50.31	-17.99	68.3	52.52	41.39	14.65	58.25	150	0	P	V
802.11n HT20 CH 157 5785MHz		11570	49.8	-24.2	74	59.64	38.98	11.01	59.83	250	0	P	H
		17355	50.01	-18.29	68.3	50.85	42.18	14.78	57.8	150	0	P	H
		11570	62.09	-11.91	74	71.93	38.98	11.01	59.83	159	154	P	V
		11570	49.32	-4.68	54	59.16	38.98	11.01	59.83	159	154	A	V
		17355	50.17	-18.13	68.3	51.01	42.18	14.78	57.8	150	0	P	V
802.11n HT20 CH 165 5825MHz		11650	48.63	-25.37	74	58.64	38.92	10.97	59.9	250	0	P	H
		17475	49.64	-18.66	68.3	49.11	42.98	14.9	57.35	150	0	P	H
		11650	61.34	-12.66	74	71.35	38.92	10.97	59.9	250	125	P	V
		11650	49.42	-4.58	54	59.43	38.92	10.97	59.9	250	125	A	V
		17475	50.11	-18.19	68.3	49.58	42.98	14.9	57.35	150	0	P	V
<b>Remark</b>	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>												



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

Table with 14 columns: WIFI Ant. 1+2+3, 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). Rows include frequency measurements from 5608.4 to 5933 MHz.



WIFI Ant. 1+2+3	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		5648.6	60.72	-7.58	68.3	54.67	32.22	7.32	33.49	150	215	P	H
		5699.4	64.27	-40.59	104.86	58.12	32.3	7.36	33.51	150	215	P	H
		5718.6	66.57	-43.94	110.51	60.37	32.36	7.36	33.52	150	215	P	H
		5724	67.74	-52.28	120.02	61.54	32.36	7.36	33.52	150	215	P	H
		5795	118.86	-	-	112.48	32.47	7.45	33.54	150	215	P	H
		5795	109.61	-	-	103.23	32.47	7.45	33.54	150	215	A	H
		5850.2	74.91	-46.93	121.84	68.41	32.55	7.51	33.56	150	215	P	H
		5863.4	73.42	-35.13	108.55	66.89	32.58	7.51	33.56	150	215	P	H
		5878.8	65.64	-36.84	102.48	59.08	32.61	7.51	33.56	150	215	P	H
		5944	61.08	-7.22	68.3	54.38	32.72	7.56	33.58	150	215	P	H
		5640.4	56.98	-11.32	68.3	50.98	32.22	7.27	33.49	235	181	P	V
		5699.6	57.58	-47.43	105.01	51.43	32.3	7.36	33.51	235	181	P	V
		5709.8	60.13	-47.92	108.05	53.96	32.33	7.36	33.52	235	181	P	V
		5720.4	60.62	-51.19	111.81	54.42	32.36	7.36	33.52	235	181	P	V
		5795	114.88	-	-	108.5	32.47	7.45	33.54	235	181	P	V
		5795	105.68	-	-	99.3	32.47	7.45	33.54	235	181	A	V
		5852.4	65.01	-51.82	116.83	58.51	32.55	7.51	33.56	235	181	P	V
		5855.4	66.04	-44.75	110.79	59.51	32.58	7.51	33.56	235	181	P	V
	5875.6	61.05	-43.8	104.85	54.49	32.61	7.51	33.56	235	181	P	V	
	5938.2	52.62	-15.68	68.3	45.95	32.69	7.56	33.58	235	181	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+3	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	49.99	-24.01	74	59.66	39.04	11.05	59.76	250	0	P	H
		17265	50.44	-17.86	68.3	52.26	41.62	14.69	58.13	150	0	P	H
		11510	61.24	-12.76	74	70.91	39.04	11.05	59.76	155	94	P	V
		11510	48.89	-5.11	54	58.56	39.04	11.05	59.76	155	94	A	V
		17265	50.22	-18.08	68.3	52.04	41.62	14.69	58.13	150	0	P	V
802.11n HT40 CH 159 5795MHz		11590	49.54	-24.46	74	59.41	38.97	11.01	59.85	250	0	P	H
		17385	50.84	-17.46	68.3	51.28	42.41	14.82	57.67	150	0	P	H
		11590	58.79	-15.21	74	68.66	38.97	11.01	59.85	158	224	P	V
		11590	46.27	-7.73	54	56.14	38.97	11.01	59.85	158	224	A	V
		17385	50.42	-17.88	68.3	50.86	42.41	14.82	57.67	150	0	P	V
<b>Remark</b>	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+3	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		5648.4	66.21	-2.09	68.3	60.16	32.22	7.32	33.49	150	219	P	H
		5699	86.56	-18	104.56	80.41	32.3	7.36	33.51	150	219	P	H
		5712.6	88.62	-20.21	108.83	82.45	32.33	7.36	33.52	150	219	P	H
		5723.4	89.14	-29.51	118.65	82.94	32.36	7.36	33.52	150	219	P	H
		5775	116.45	-	-	110.09	32.44	7.45	33.53	150	219	P	H
		5775	106.56	-	-	100.2	32.44	7.45	33.53	150	219	A	H
		5853	86.2	-29.26	115.46	79.7	32.55	7.51	33.56	150	219	P	H
		5856.8	82.79	-27.61	110.4	76.26	32.58	7.51	33.56	150	219	P	H
		5879	76.74	-25.59	102.33	70.18	32.61	7.51	33.56	150	219	P	H
		5929.6	63.13	-5.17	68.3	56.46	32.69	7.56	33.58	150	219	P	H
		5648.8	58.12	-10.18	68.3	52.07	32.22	7.32	33.49	150	178	P	V
		5693.6	75.76	-24.82	100.58	69.61	32.3	7.36	33.51	150	178	P	V
		5718.2	77.23	-33.17	110.4	71.03	32.36	7.36	33.52	150	178	P	V
		5723	79.91	-37.83	117.74	73.71	32.36	7.36	33.52	150	178	P	V
		5775	111.11	-	-	104.75	32.44	7.45	33.53	150	178	P	V
		5775	101.06	-	-	94.7	32.44	7.45	33.53	150	178	A	V
		5853.4	73.5	-41.05	114.55	67	32.55	7.51	33.56	150	178	P	V
		5864.8	75.93	-32.22	108.15	69.4	32.58	7.51	33.56	150	178	P	V
		5875.2	64.88	-40.27	105.15	58.32	32.61	7.51	33.56	150	178	P	V
		5925.8	54.85	-13.45	68.3	48.18	32.69	7.56	33.58	150	178	P	V

**Remark**

- No other spurious found.
- All results are PASS against Peak and Average limit line.



Band 4 5725~5850MHz

WIFI 802.11ac VHT80 (Harmonic @ 3m)

WIFI Ant. 1+2+3	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		11550	47.53	-26.47	74	57.31	39	11.03	59.81	250	0	P	H
		17325	50.87	-17.43	68.3	52.06	41.96	14.78	57.93	150	0	P	H
		11550	53	-21	74	62.78	39	11.03	59.81	221	146	P	V
		11550	42.78	-11.22	54	52.56	39	11.03	59.81	221	146	A	V
		17325	50.47	-17.83	68.3	51.66	41.96	14.78	57.93	150	0	P	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against Peak and Average limit line.</li> </ol>												



Emission below 1GHz  
5GHz WIFI 802.11a (LF @ 3m)

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+3		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )
5GHz 802.11a LF		80.44	23.05	-16.95	40	45.8	9.5	1.14	33.39	100	200	P	H
		166.77	23.95	-19.55	43.5	44.8	10.83	1.53	33.21	-	-	P	H
		207.51	20.28	-23.22	43.5	41.47	10.39	1.57	33.15	-	-	P	H
		298.69	18.11	-27.89	46	35.45	13.76	1.94	33.04	-	-	P	H
		442.25	21.75	-24.25	46	35.09	17.09	2.22	32.65	-	-	P	H
		523.73	23.91	-22.09	46	35.8	18.11	2.41	32.41	-	-	P	H
		42.61	33.46	-6.54	40	54.04	11.81	1	33.39	100	200	P	V
		76.56	24.41	-15.59	40	47.91	8.74	1.14	33.38	-	-	P	V
		125.06	21.14	-22.36	43.5	41.32	11.74	1.38	33.3	-	-	P	V
		167.74	24.5	-19	43.5	45.38	10.8	1.53	33.21	-	-	P	V
		449.04	20.36	-25.64	46	33.58	17.19	2.22	32.63	-	-	P	V
		525.67	22.19	-23.81	46	34.04	18.13	2.41	32.39	-	-	P	V
Remark	<ol style="list-style-type: none"> <li>No other spurious found.</li> <li>All results are PASS against limit line.</li> </ol>												



**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>Peak</b> or <b>Average</b>
H/V	<b>Horizontal</b> or <b>Vertical</b>



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		( 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

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

**For Peak Limit @ 2390MHz:**

- 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)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

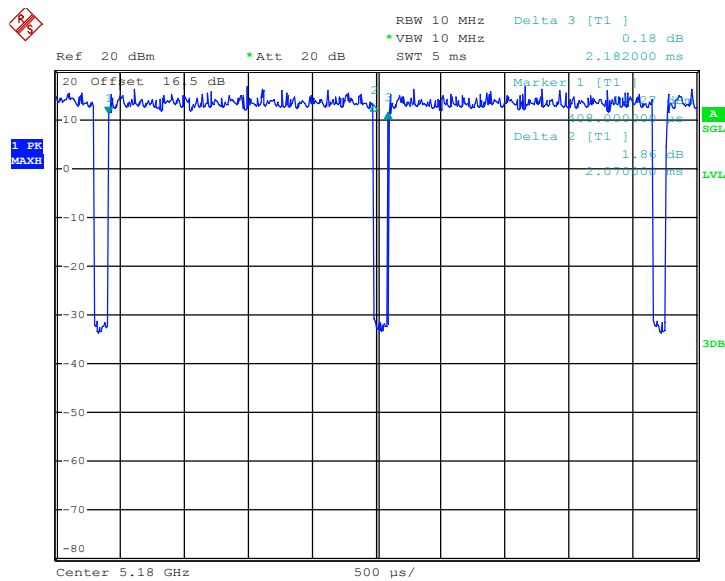
- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

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

## Appendix C. Duty Cycle Plots

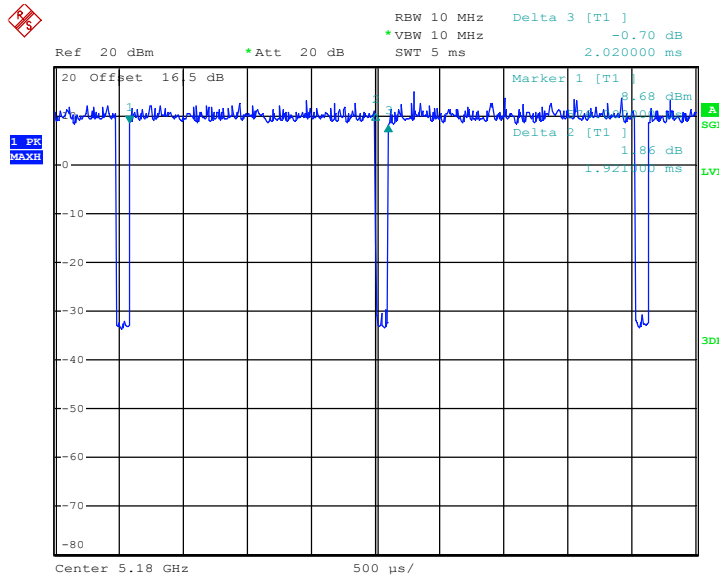
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1+2+3	802.11a	94.87	2.07	0.48	1kHz
1+2+3	802.11n HT20	95.10	1.92	0.52	1kHz
1+2+3	802.11n HT40	91.86	0.95	1.05	3kHz
1+2+3	802.11ac VHT80	94.31	0.46	2.16	3kHz

802.11a

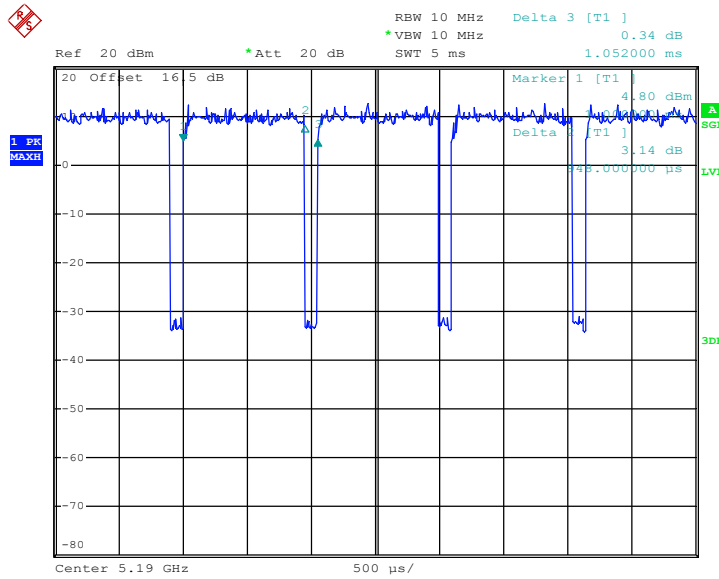




802.11n HT20



802.11n HT40







802.11ac VHT80

