



# FCC RF Test Report

**APPLICANT** : Ubiquiti Networks, Inc.  
**EQUIPMENT** : rocket PRISM AC  
**BRAND NAME** : UBIQUITI  
**MODEL NAME** : R2AC  
**FCC ID** : SWX-R2ACN  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure

The product was received on Jul. 11, 2017 and testing was completed on Aug. 03, 2017. We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



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FCC ID : SWX-R2ACN

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### REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR581010-04B	Rev. 01	Initial issue of report	Aug. 17, 2017



### 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 5.06 dB at 31.890 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 12.3 dB at 0.502 MHz
3.6	15.407(g)	Frequency Stability	Within Operation Band	Pass	-
3.7	15.407(c)	Automatically Discontinue Transmission	Discontinue Transmission	Pass	-
3.8	15.203 & 15.407(a)	Antenna Requirement	N/A	Pass	-



# 1 General Description

## 1.1 Applicant

Ubiquiti Networks, Inc.  
685 Third Avenue, 27th Floor New York, New York 10017 USA

## 1.2 Manufacturer

Ubiquiti Networks, Inc.  
685 Third Avenue, 27th Floor New York, New York 10017 USA

## 1.3 Product Feature of Equipment Under Test

Wi-Fi 2.4GHz 802.11n/ac, Wi-Fi 5GHz 802.11a/n, and GPS.

Product Specification subjective to this standard	
Antenna Type	WLAN 2.4G: Ant. 1: Omni Antenna Ant. 2: Dish Antenna WLAN 5G: Ant. 3: Internal Antenna GPS : Patch Antenna

## 1.4 Modification of EUT

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



### 1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	TH05-HY	CO05-HY

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

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	
	03CH13-HY	

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

### 1.6 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 v01r04.
- 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). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- 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
	-	-	-	-
	153	5765	161	5805
	-	-	165	5825

### 2.2 Test Mode

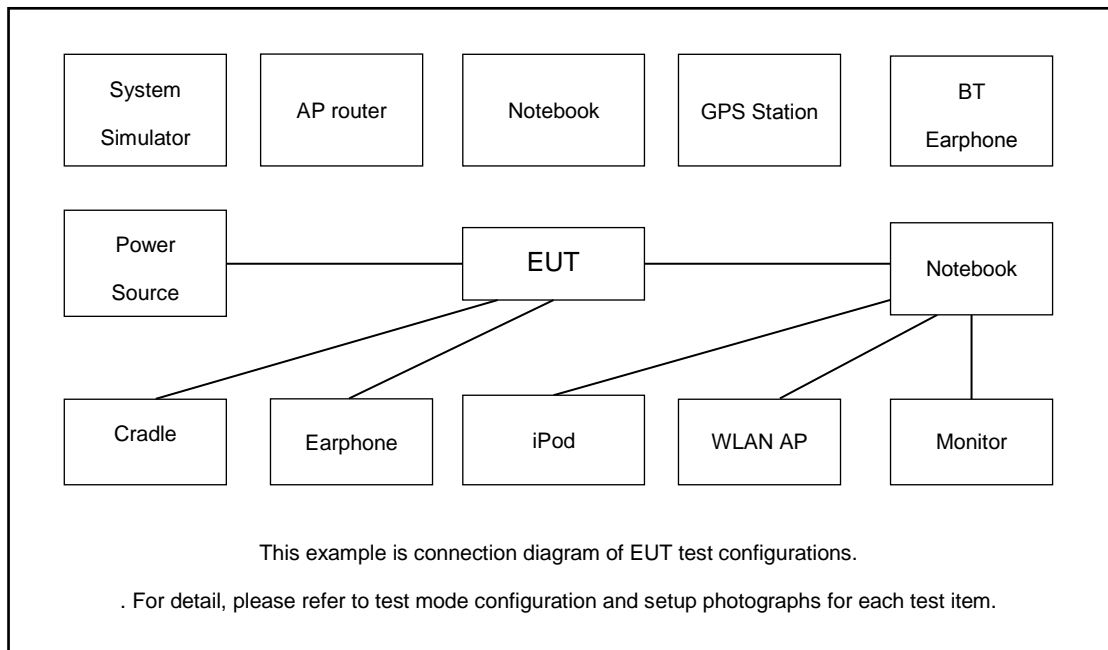
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0

AC Conducted Emission	Mode 1 : WLAN (2.4GHz) Link + WLAN (5GHz) Link + GPS Rx + PoE + LAN Link
-----------------------	--

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

### 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.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	Ubiquiti	R2AC-Gen2(5G)	N/A	Shielded, 1.0m	Shielded, 1.0m
3.	NOTE BOOK	Dell	P20G	FCC DoC	N/A	AC I/P: Unshielded,1.2 m
4.	NOTE BOOK	Dell	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded,1.2 m
5.	NOTE BOOK	Dell	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded,1.2 m





## 2.5 EUT Operation Test Setup

The RF test items, programmed RF utility, "CMD" installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

## 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 4.2 dB and 10dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

### 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.

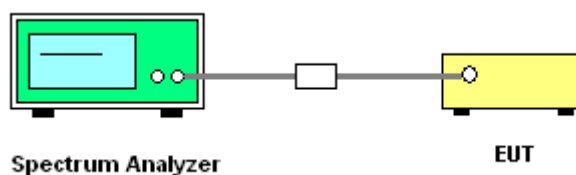
##### 3.1.2 Measuring Instruments

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 v01r04.  
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.

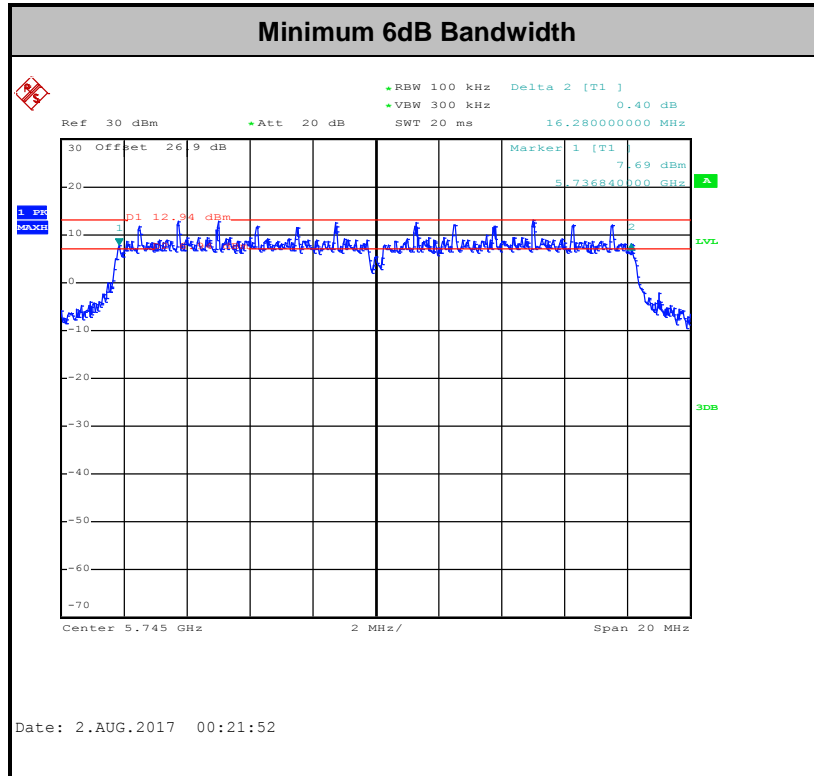
##### 3.1.4 Test Setup

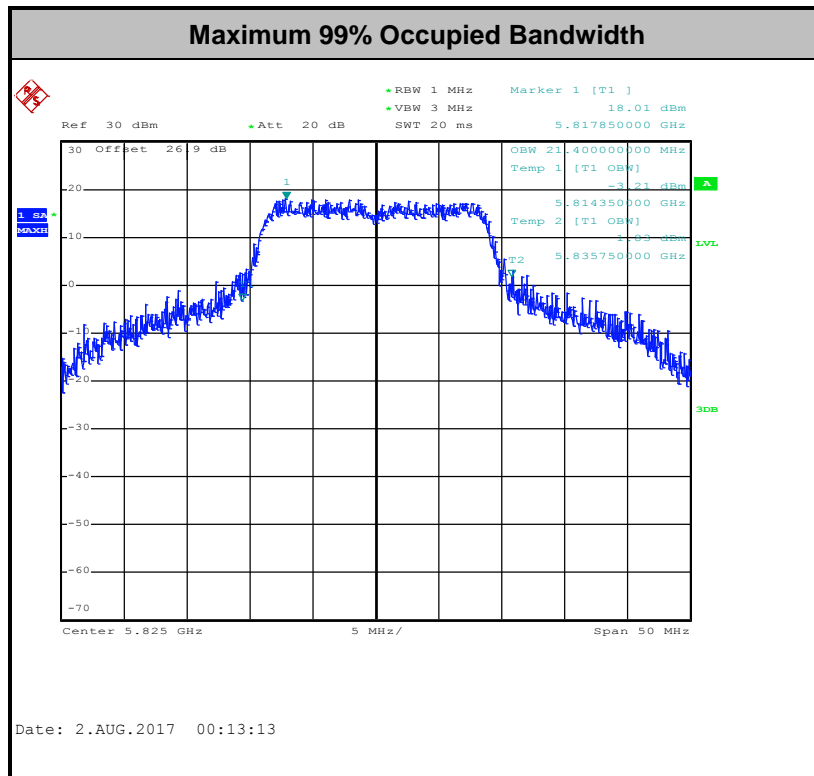
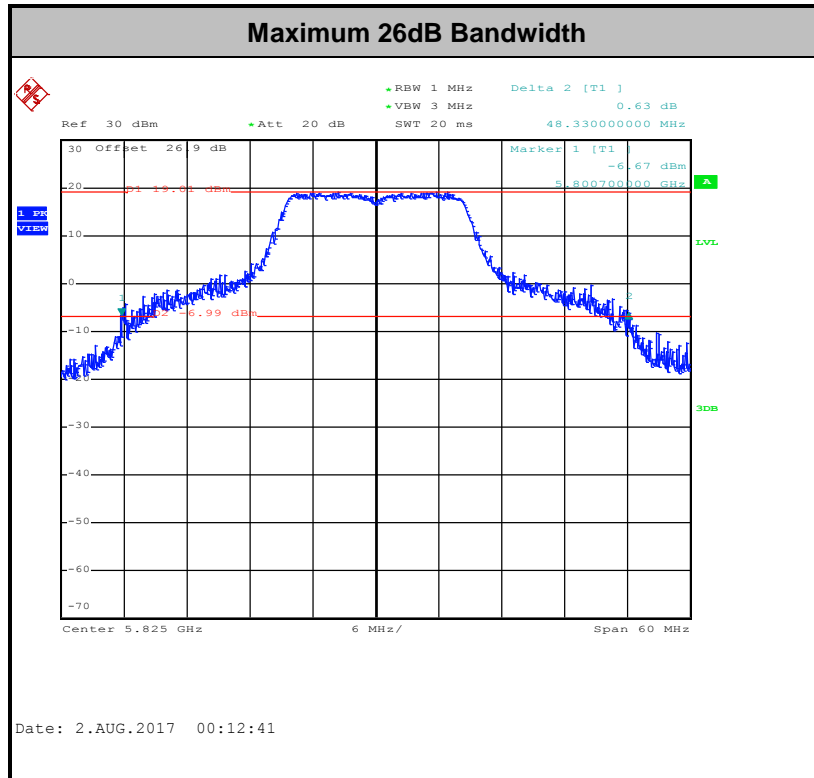




### 3.1.5 Test Result of 6dB Bandwidth

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.

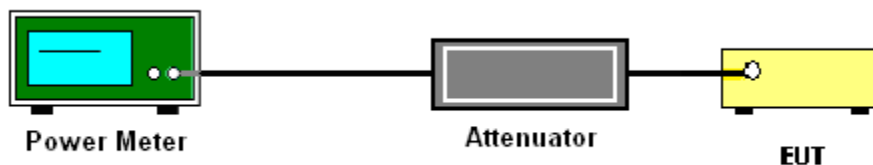
### 3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04.

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 v01r04. 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).

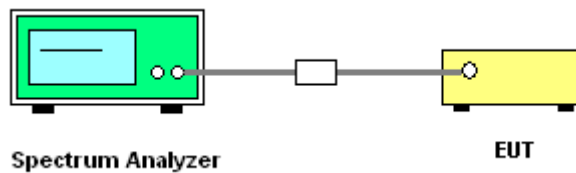
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 300 kHz.
- Set VBW  $\geq$  1 MHz.
- Number of points in sweep  $\geq$  2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add  $10 \log(500\text{kHz}/\text{RBW})$  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  $10 \log(N_{ANT})$  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  $10 \log(N_{ANT})$  dB is added to each spectrum value before comparing to the emission limit. The addition of  $10 \log(N_{ANT})$  dB serves to apportion the emission limit among the  $N_{ANT}$  outputs so that each output is permitted to contribute no more than  $1/N_{ANT}^{th}$  of the PSD limit.

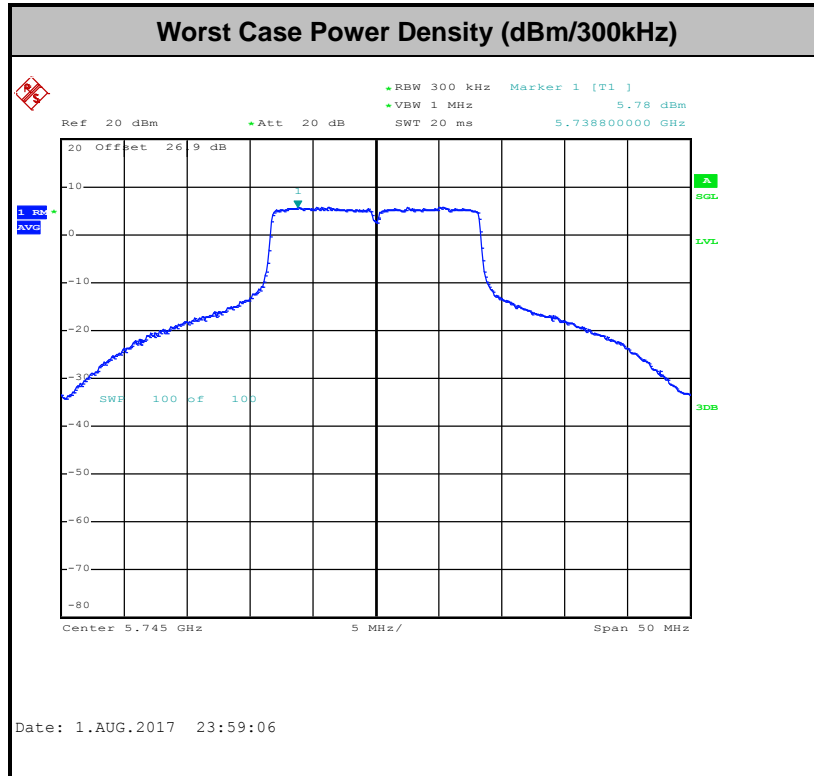
### 3.3.4 Test Setup





### 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 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

(3) KDB789033 D02 v01r04 G)2)c)

- (i) Sections 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 v01r04. 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

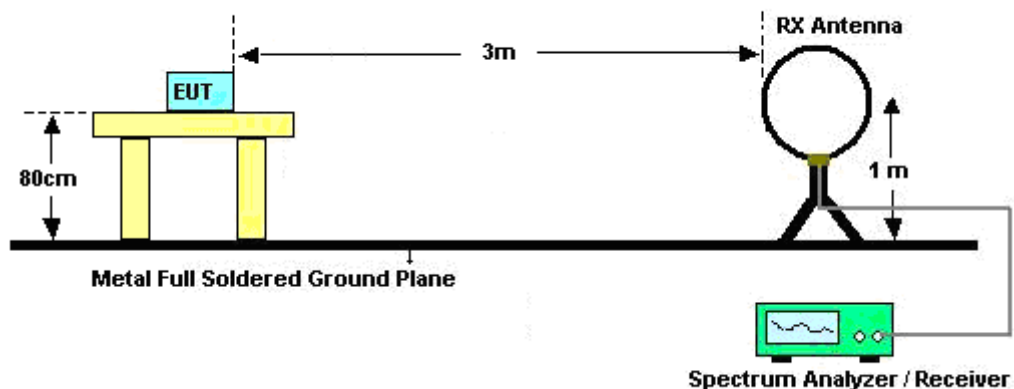
(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- 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.

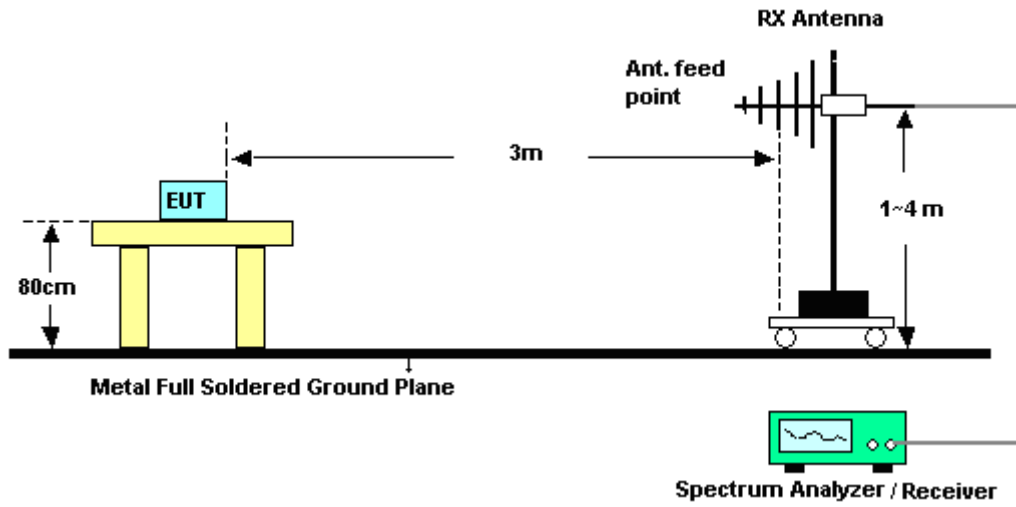
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband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

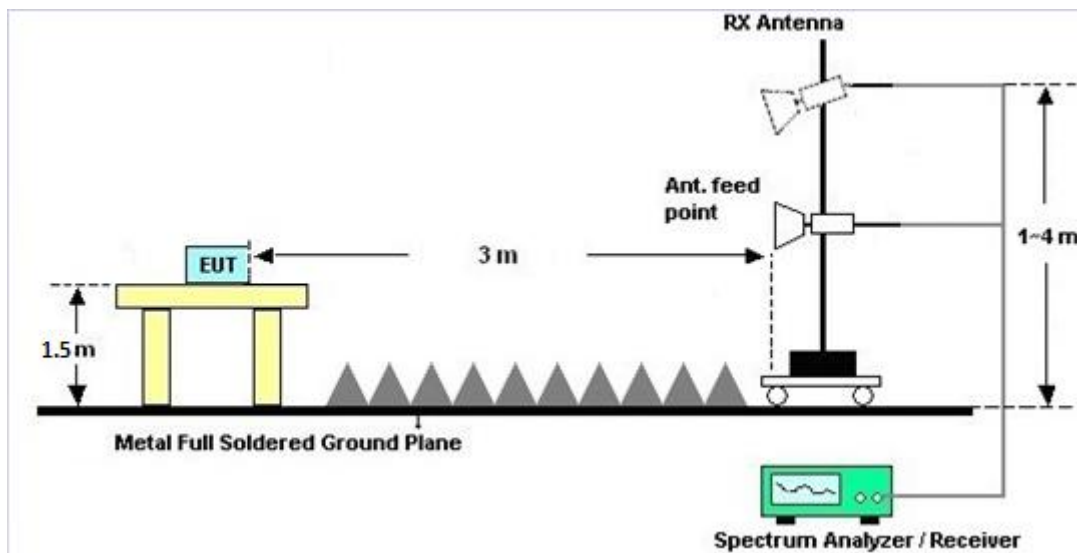
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





### **3.4.5 Test Results of Radiated Spurious 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 Spurious at Band Edges**

Please refer to Appendix C and D.

### **3.4.7 Duty Cycle**

Please refer to Appendix E.

### **3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)**

Please refer to Appendix C and D.



### 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.

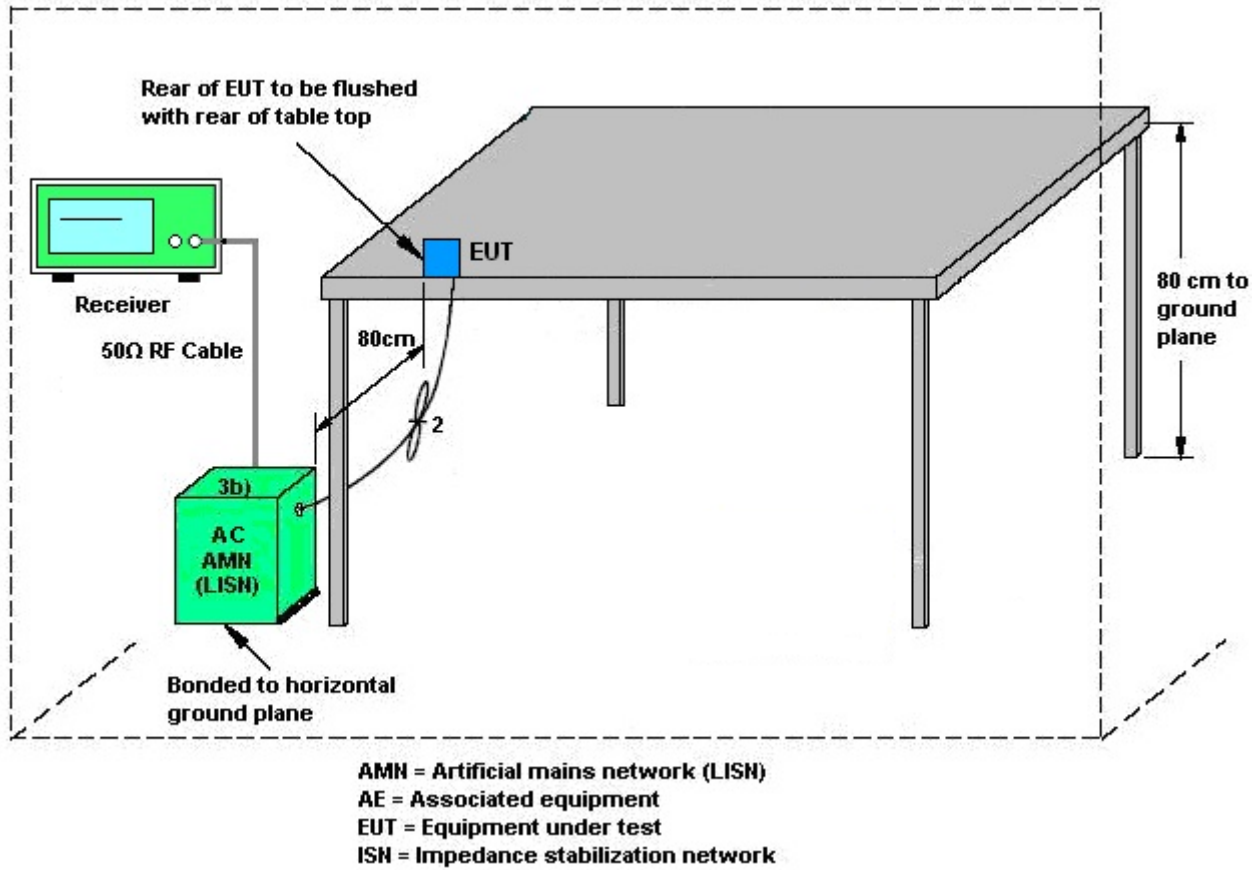
#### 3.5.2 Measuring Instruments

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



### 3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



### 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**

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**

The antenna gain is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Power Meter	Anritsu	ML2495A	0932001	300MHz~40GHz	Sep. 29, 2016	Aug. 01, 2017~ Aug. 02, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	0846202	300MHz~40GHz	Sep. 29, 2016	Aug. 01, 2017~ Aug. 02, 2017	Sep. 28, 2017	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100057	9kHz-40GHz	Nov. 25, 2016	Aug. 01, 2017~ Aug. 02, 2017	Nov. 24, 2017	Conducted (TH05-HY)
Temperature Chamber	ESPEC	SH-641	92013720	-40℃ ~90℃	Sep. 01, 2016	Aug. 01, 2017~ Aug. 02, 2017	Aug. 31, 2017	Conducted (TH05-HY)
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	Dec. 01, 2016	Aug. 01, 2017~ Aug. 02, 2017	Nov. 30, 2017	Conducted (TH05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Aug. 03, 2017	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9kHz~7GHz	Aug. 30, 2016	Aug. 03, 2017	Aug. 29, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 29, 2016	Aug. 03, 2017	Nov. 28, 2017	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Dec. 06, 2016	Aug. 03, 2017	Dec. 05, 2017	Conduction (CO05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Jul. 28, 2017	Oct. 19, 2018	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	N/A	Mar. 03, 2017	Jul. 28, 2017	Mar. 02, 2018	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	9KHz~1GHz	Dec. 21, 2016	Jul. 28, 2017	Dec. 20, 2017	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800 N1D01N-06	40103&04	30MHz to 1GHz	Jan. 07, 2017	Jul. 28, 2017	Jan. 06, 2018	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	May 02, 2017	Jul. 28, 2017	May 01, 2018	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	May 22, 2017	Jul. 28, 2017	May 21, 2018	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	N/A	Mar. 15, 2017	Jul. 28, 2017	Mar. 14, 2018	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jul. 28, 2017	N/A	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jul. 28, 2017	N/A	Radiation (03CH13-HY)
Preamplifier	MITEQ	TTA 1840-35-HG	1887435	18GHz ~ 40GHz	Oct. 13, 2016	Jul. 28, 2017	Oct. 12, 2017	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917025 1	18GHz- 40GHz	Nov. 08, 2016	Jul. 28, 2017	Nov. 07, 2017	Radiation (03CH13-HY)



## 5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	2.70
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.90
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### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	5.40
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### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	4.30
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**Appendix A. Test Result of Conducted Test Items**

Test Engineer:	Derek Hsu	Temperature:	21~25	°C
Test Date:	2017/08/01~2017/08/02	Relative Humidity:	51~54	%

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

Band IV									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Bandwidth (MHz)	26 dB Bandwidth (MHz)	6 dB Bandwidth (MHz)	6dB Bandwidth min. Limit (MHz)	Pass/Fail
11a	6M bps	1	149	5745	20.85	43.38	16.28	0.5	Pass
11a	6Mbps	1	157	5785	19.9	43.32	16.32	0.5	Pass
11a	6Mbps	1	165	5825	19.6	43.86	16.32	0.5	Pass
HT20	MCS 0	1	149	5745	21.05	47.88	17.54	0.5	Pass
HT20	MCS 0	1	157	5785	20.35	45.78	17.54	0.5	Pass
HT20	MCS 0	1	165	5825	21.4	48.33	17.52	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
11a	6M bps	1	149	5745	0.45	24.45	30.00	-6.00		Pass
11a	6Mbps	1	157	5785	0.45	24.15	30.00	-6.00		Pass
11a	6Mbps	1	165	5825	0.45	24.21	30.00	-6.00		Pass
HT20	MCS 0	1	149	5745	0.46	24.46	30.00	-6.00		Pass
HT20	MCS 0	1	157	5785	0.46	24.21	30.00	-6.00		Pass
HT20	MCS 0	1	165	5825	0.46	24.26	30.00	-6.00		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
11a	6M bps	1	149	5745	0.45	2.22	8.45	30.00	-6.00	Pass
11a	6Mbps	1	157	5785	0.45	2.22	7.95	30.00	-6.00	Pass
11a	6Mbps	1	165	5825	0.45	2.22	7.90	30.00	-6.00	Pass
HT20	MCS 0	1	149	5745	0.46	2.22	7.81	30.00	-6.00	Pass
HT20	MCS 0	1	157	5785	0.46	2.22	7.75	30.00	-6.00	Pass
HT20	MCS 0	1	165	5825	0.46	2.22	7.60	30.00	-6.00	Pass

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

Band IV										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Center Frequency (MHz)	Frequency Deviation (MHz)	Frequency Stability (ppm)	Temperature (°C)	Voltage (V)	Note
11a	6M bps	1	149	5745	5745.200	0.200	34.81	80	230	
11a	6M bps	1	149	5745	5745.050	0.050	8.70	-40	230	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	20	253	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	20	217	
11a	6M bps	1	149	5745	5745.000	0.000	0.00	20	230	



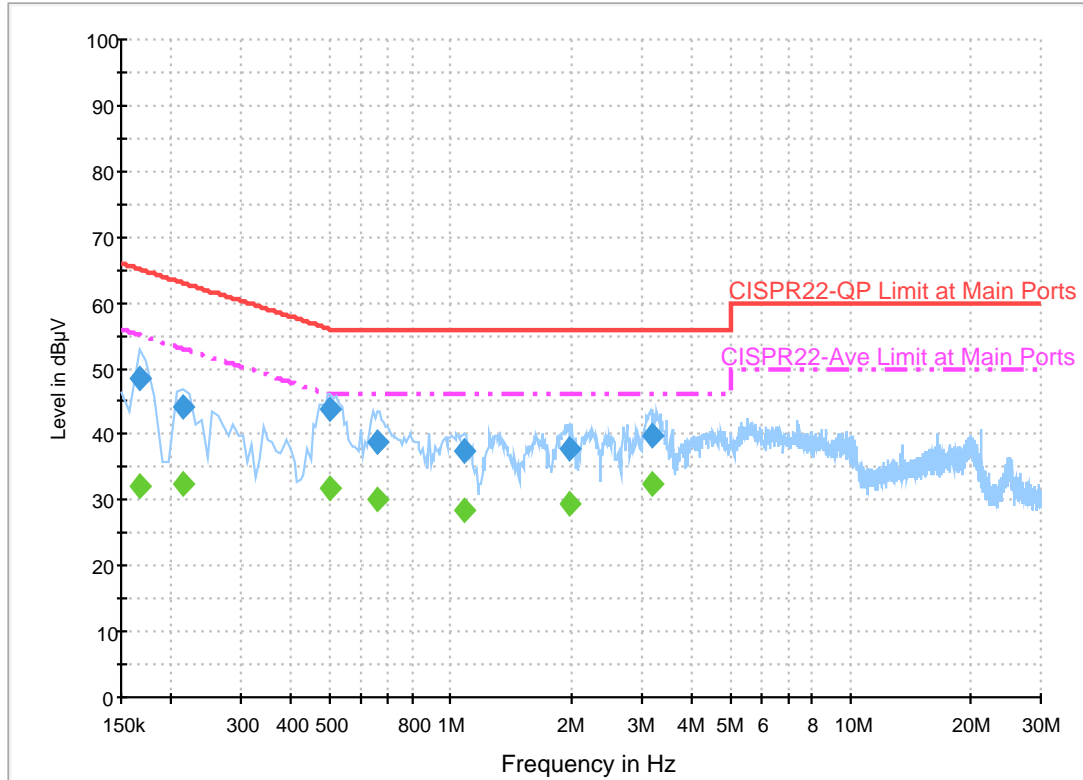
## Appendix B. AC Conducted Emission Test Results

Test Engineer :	Eric Jeng	Temperature :	27~29°C
		Relative Humidity :	65~68%

# EUT Information

Report NO : 581010-04  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Line

ENV216 Auto Test FCC Power Bar - L



## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	48.6	Off	L1	19.6	16.6	65.2
0.214000	44.1	Off	L1	19.6	18.9	63.0
0.502000	43.7	Off	L1	19.6	12.3	56.0
0.654000	38.9	Off	L1	19.6	17.1	56.0
1.078000	37.6	Off	L1	19.6	18.4	56.0
1.982000	37.8	Off	L1	19.6	18.2	56.0
3.190000	39.9	Off	L1	19.6	16.1	56.0

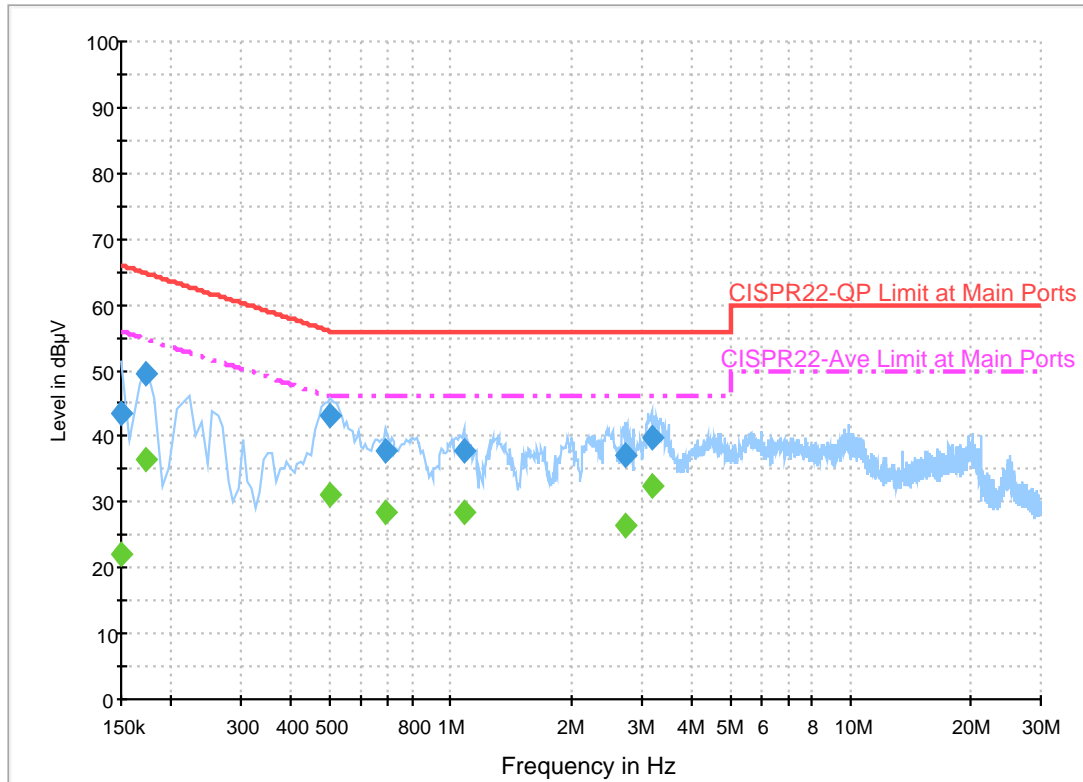
## Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.166000	32.0	Off	L1	19.6	23.2	55.2
0.214000	32.3	Off	L1	19.6	20.7	53.0
0.502000	31.8	Off	L1	19.6	14.2	46.0
0.654000	30.2	Off	L1	19.6	15.8	46.0
1.078000	28.3	Off	L1	19.6	17.7	46.0
1.982000	29.5	Off	L1	19.6	16.5	46.0
3.190000	32.5	Off	L1	19.6	13.5	46.0

# EUT Information

Report NO : 581010-04  
 Test Mode : Mode 1  
 Test Voltage : 120Vac/60Hz  
 Phase : Neutral

ENV216 Auto Test FCC Power Bar - N



## Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	43.4	Off	N	19.5	22.6	66.0
0.174000	49.4	Off	N	19.5	15.4	64.8
0.502000	43.2	Off	N	19.5	12.8	56.0
0.686000	37.8	Off	N	19.5	18.2	56.0
1.078000	37.8	Off	N	19.6	18.2	56.0
2.726000	37.2	Off	N	19.4	18.8	56.0
3.182000	39.8	Off	N	19.6	16.2	56.0

## Final Result 2

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	22.2	Off	N	19.5	33.8	56.0
0.174000	36.3	Off	N	19.5	18.5	54.8
0.502000	31.2	Off	N	19.5	14.8	46.0
0.686000	28.3	Off	N	19.5	17.7	46.0
1.078000	28.5	Off	N	19.6	17.5	46.0
2.726000	26.3	Off	N	19.4	19.7	46.0
3.182000	32.6	Off	N	19.6	13.4	46.0



## Appendix C. Radiated Spurious Emission

Test Engineer :	Alex Jheng, Bill Chang and Wilson Wu	Temperature :	24.5~25.3°C
		Relative Humidity :	49~51%

### 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		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
802.11a CH 149 5745MHz		5622.2	50.82	-17.38	68.2	41.27	32.52	7.7	30.67	197	64	P	H	
		5696.2	49.65	-52.75	102.4	39.99	32.59	7.77	30.7	197	64	P	H	
		5707.4	49.32	-57.95	107.27	39.62	32.61	7.79	30.7	197	64	P	H	
		5723.8	50.31	-69.15	119.46	40.59	32.62	7.81	30.71	197	64	P	H	
	*	5745	88.16	-	-	78.42	32.64	7.83	30.73	197	64	P	H	
	*	5745	80.48	-	-	70.74	32.64	7.83	30.73	197	64	A	H	
														H
														H
			5649	49.68	-18.52	68.2	40.09	32.54	7.73	30.68	100	354	P	V
			5697.6	49.2	-54.23	103.43	39.54	32.59	7.77	30.7	100	354	P	V
			5707.2	47.19	-60.03	107.22	37.49	32.61	7.79	30.7	100	354	P	V
			5721.2	47.8	-65.74	113.54	38.08	32.62	7.81	30.71	100	354	P	V
	*		5745	88.47	-	-	78.73	32.64	7.83	30.73	100	354	P	V
	*		5745	80.61	-	-	70.87	32.64	7.83	30.73	100	354	A	V
														V
													V	



WIFI Ant. 1	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 )
		5639.6	48.28	-19.92	68.2	38.7	32.54	7.72	30.68	215	59	P	H
		5695.6	48.48	-53.48	101.96	38.82	32.59	7.77	30.7	215	59	P	H
		5714.6	48.47	-60.82	109.29	38.78	32.61	7.79	30.71	215	59	P	H
		5723.4	48.53	-70.02	118.55	38.81	32.62	7.81	30.71	215	59	P	H
	*	5785	85.95	-	-	76.15	32.68	7.86	30.74	215	59	P	H
	*	5785	78.22	-	-	68.42	32.68	7.86	30.74	215	59	A	H
		5854	48.78	-64.3	113.08	38.91	32.76	7.88	30.77	215	59	P	H
		5861.8	50.26	-58.63	108.89	40.39	32.76	7.88	30.77	215	59	P	H
		5911.4	50.15	-28.08	78.23	40.24	32.81	7.89	30.79	215	59	P	H
		5944	50.87	-17.33	68.2	40.95	32.85	7.89	30.82	215	59	P	H
													H
													H
<b>802.11a</b>													
<b>CH 157</b>													
<b>5785MHz</b>		5633.2	49.04	-19.16	68.2	39.45	32.54	7.72	30.67	100	354	P	V
		5690.4	51.77	-46.35	98.12	42.11	32.59	7.77	30.7	100	354	P	V
		5715.2	48.1	-61.36	109.46	38.41	32.61	7.79	30.71	100	354	P	V
		5720.4	47.35	-64.36	111.71	37.63	32.62	7.81	30.71	100	354	P	V
	*	5785	82.48	-	-	72.68	32.68	7.86	30.74	100	354	P	V
	*	5785	75.03	-	-	65.23	32.68	7.86	30.74	100	354	A	V
		5851.4	47.66	-71.35	119.01	37.81	32.74	7.88	30.77	100	354	P	V
		5862.4	49.92	-58.81	108.73	40.05	32.76	7.88	30.77	100	354	P	V
		5903.4	50.1	-34.05	84.15	40.2	32.8	7.89	30.79	100	354	P	V
		5944.4	48.99	-19.21	68.2	39.07	32.85	7.89	30.82	100	354	P	V
													V
													V



WIFI Ant. 1	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	89.88	-	-	80.03	32.73	7.88	30.76	194	54	P	H	
	*	5825	82.69	-	-	72.84	32.73	7.88	30.76	194	54	A	H	
		5852.4	48.13	-68.6	116.73	38.28	32.74	7.88	30.77	194	54	P	H	
		5873.4	48.86	-56.79	105.65	38.98	32.78	7.88	30.78	194	54	P	H	
		5913	49.07	-27.98	77.05	39.18	32.81	7.89	30.81	194	54	P	H	
		5940	49.1	-19.1	68.2	39.18	32.85	7.89	30.82	194	54	P	H	
														H
														H
	*	5825	87.03	-	-	77.18	32.73	7.88	30.76	259	347	P	V	
	*	5825	79.97	-	-	70.12	32.73	7.88	30.76	259	347	A	V	
		5853	47.94	-67.42	115.36	38.09	32.74	7.88	30.77	259	347	P	V	
		5872.4	48.49	-57.44	105.93	38.61	32.78	7.88	30.78	259	347	P	V	
		5922.4	49.23	-20.89	70.12	39.32	32.83	7.89	30.81	259	347	P	V	
		5940.6	49.62	-18.58	68.2	39.7	32.85	7.89	30.82	259	347	P	V	
														V
														V
														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	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	46.48	-27.52	74	51.17	39.91	11.3	56.41	100	0	P	H	
		17235	57.52	-10.68	68.2	59.15	40.56	13.44	56.27	100	0	P	H	
													H	
													H	
			11490	46.28	-27.72	74	50.97	39.91	11.3	56.41	100	0	P	V
			17235	61.67	-6.53	68.2	63.3	40.56	13.44	56.27	100	0	P	V
														V
802.11a CH 157 5785MHz		11570	45.26	-28.74	74	50.15	39.73	11.31	56.44	100	0	P	H	
		17355	55.7	-12.5	68.2	57.17	40.84	13.52	56.46	100	0	P	H	
													H	
													H	
			11570	45.6	-28.4	74	50.49	39.73	11.31	56.44	100	0	P	V
			17355	58.69	-9.51	68.2	60.16	40.84	13.52	56.46	100	0	P	V
														V
802.11a CH 165 5825MHz		11650	45.99	-28.01	74	51.05	39.57	11.34	56.48	100	0	P	H	
		17475	52.86	-15.34	68.2	54.18	41.12	13.59	56.65	100	0	P	H	
													H	
													H	
			11650	44.76	-29.24	74	49.82	39.57	11.34	56.48	100	0	P	V
			17475	54.78	-13.42	68.2	56.1	41.12	13.59	56.65	100	0	P	V
														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	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		5644.2	50.05	-18.15	68.2	40.47	32.54	7.72	30.68	197	65	P	H	
		5693	50.09	-49.95	100.04	40.43	32.59	7.77	30.7	197	65	P	H	
		5710	49.99	-58.01	108	40.29	32.61	7.79	30.7	197	65	P	H	
		5721.2	50.21	-63.33	113.54	40.49	32.62	7.81	30.71	197	65	P	H	
	*	5745	87.63	-	-	77.89	32.64	7.83	30.73	197	65	P	H	
	*	5745	79.78	-	-	70.04	32.64	7.83	30.73	197	65	A	H	
														H
														H
			5606.2	50.48	-17.72	68.2	40.96	32.5	7.68	30.66	100	352	P	V
			5666.6	49.55	-30.97	80.52	39.92	32.57	7.75	30.69	100	352	P	V
			5712.8	49.97	-58.82	108.79	40.28	32.61	7.79	30.71	100	352	P	V
			5724.8	49.23	-72.51	121.74	39.51	32.62	7.81	30.71	100	352	P	V
	*		5745	87.99	-	-	78.25	32.64	7.83	30.73	100	352	P	V
	*		5745	80.11	-	-	70.37	32.64	7.83	30.73	100	352	A	V
														V
														V



WIFI Ant. 1	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 )
		5618.2	50.32	-17.88	68.2	40.77	32.52	7.7	30.67	197	61	P	H
		5690.4	49.47	-48.65	98.12	39.81	32.59	7.77	30.7	197	61	P	H
		5704	50.18	-56.14	106.32	40.48	32.61	7.79	30.7	197	61	P	H
		5722.4	47.15	-69.12	116.27	37.43	32.62	7.81	30.71	197	61	P	H
	*	5785	85.4	-	-	75.6	32.68	7.86	30.74	197	61	P	H
	*	5785	77.81	-	-	68.01	32.68	7.86	30.74	197	61	A	H
		5854.8	49.21	-62.05	111.26	39.34	32.76	7.88	30.77	197	61	P	H
		5874.4	50.27	-55.1	105.37	40.39	32.78	7.88	30.78	197	61	P	H
		5897.2	50.2	-38.53	88.73	40.31	32.8	7.88	30.79	197	61	P	H
		5941	49.8	-18.4	68.2	39.88	32.85	7.89	30.82	197	61	P	H
802.11n													H
HT20													H
CH 157		5644	49.11	-19.09	68.2	39.53	32.54	7.72	30.68	100	355	P	V
5785MHz		5652.2	49.65	-20.19	69.84	40.04	32.56	7.73	30.68	100	355	P	V
		5714.4	49.05	-60.18	109.23	39.36	32.61	7.79	30.71	100	355	P	V
		5720.8	48.76	-63.86	112.62	39.04	32.62	7.81	30.71	100	355	P	V
	*	5785	83.29	-	-	73.49	32.68	7.86	30.74	100	355	P	V
	*	5785	74.88	-	-	65.08	32.68	7.86	30.74	100	355	A	V
		5850.2	49.52	-72.22	121.74	39.67	32.74	7.88	30.77	100	355	P	V
		5863.4	50.1	-58.35	108.45	40.24	32.76	7.88	30.78	100	355	P	V
		5907.4	50.46	-30.73	81.19	40.55	32.81	7.89	30.79	100	355	P	V
		5927.8	50.24	-17.96	68.2	40.33	32.83	7.89	30.81	100	355	P	V
													V
													V



WIFI Ant. 1	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	89.24	-	-	79.39	32.73	7.88	30.76	197	55	P	H	
	*	5825	81.25	-	-	71.4	32.73	7.88	30.76	197	55	A	H	
		5852.2	49.69	-67.49	117.18	39.84	32.74	7.88	30.77	197	55	P	H	
		5867.2	49.95	-57.43	107.38	40.09	32.76	7.88	30.78	197	55	P	H	
		5903.4	51.6	-32.55	84.15	41.7	32.8	7.89	30.79	197	55	P	H	
		5946.2	50.26	-17.94	68.2	40.34	32.85	7.89	30.82	197	55	P	H	
														H
														H
	*	5825	86.12	-	-	76.27	32.73	7.88	30.76	270	349	P	V	
	*	5825	78.93	-	-	69.08	32.73	7.88	30.76	270	349	A	V	
		5850.4	48.42	-72.87	121.29	38.57	32.74	7.88	30.77	270	349	P	V	
		5862.2	48.76	-60.02	108.78	38.89	32.76	7.88	30.77	270	349	P	V	
		5878	49.9	-53.07	102.97	40.02	32.78	7.88	30.78	270	349	P	V	
		5930.6	48.4	-19.8	68.2	38.49	32.83	7.89	30.81	270	349	P	V	
														V
														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 (Harmonic @ 3m)**

WIFI Ant. 1	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	44.97	-29.03	74	49.66	39.91	11.3	56.41	100	0	P	H
		17235	59.75	-8.45	68.2	61.38	40.56	13.44	56.27	100	0	P	H
													H
													H
		11490	45.5	-28.5	74	50.19	39.91	11.3	56.41	100	0	P	V
		17235	61.18	-7.02	68.2	62.81	40.56	13.44	56.27	100	0	P	V
													V
802.11n HT20 CH 157 5785MHz		11570	44.98	-29.02	74	49.87	39.73	11.31	56.44	100	0	P	H
		17355	58.39	-9.81	68.2	59.86	40.84	13.52	56.46	100	0	P	H
													H
													H
		11570	45.97	-28.03	74	50.86	39.73	11.31	56.44	100	0	P	V
		17355	60.32	-7.88	68.2	61.79	40.84	13.52	56.46	100	0	P	V
													V
802.11n HT20 CH 165 5825MHz		11650	45.75	-28.25	74	50.81	39.57	11.34	56.48	100	0	P	H
		17475	52.22	-15.98	68.2	53.54	41.12	13.59	56.65	100	0	P	H
													H
													H
		11650	45.73	-28.27	74	50.79	39.57	11.34	56.48	100	0	P	V
		17475	56.1	-12.1	68.2	57.42	41.12	13.59	56.65	100	0	P	V
													V
Remark	1. No other spurious found.												
	2. All results are PASS against Peak and Average limit line.												



Band 4 5725~5850MHz

Emission below 1GHz

5GHz WIFI 802.11a (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		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
5GHz 802.11a LF		139.08	31.57	-11.93	43.5	48.19	14.43	1.19	32.28	-	-	P	H	
		160.95	36.26	-7.24	43.5	54.9	12.31	1.27	32.28	100	0	P	H	
		173.91	30.74	-12.76	43.5	49.57	12.03	1.35	32.28	-	-	P	H	
		600.3	33.3	-12.7	46	40.28	22.71	2.42	32.21	-	-	P	H	
		750.1	30.35	-15.65	46	34.61	25.04	2.68	32.08	-	-	P	H	
		874.7	36.48	-9.52	46	38.95	26.14	2.9	31.63	-	-	P	H	
														H
														H
														H
														H
														H
														H
														H
														H
			78.06	29.17	-10.83	40	50	10.43	0.95	32.3	100	0	P	V
			118.83	28.28	-15.22	43.5	45.78	13.62	1.09	32.29	-	-	P	V
			160.14	29.05	-14.45	43.5	47.52	12.48	1.27	32.28	-	-	P	V
			600.3	27.59	-18.41	46	34.57	22.71	2.42	32.21	-	-	P	V
			750.1	31.04	-14.96	46	35.3	25.04	2.68	32.08	-	-	P	V
			874.7	32.09	-13.91	46	34.56	26.14	2.9	31.63	-	-	P	V
													V	
													V	
													V	
													V	
													V	
													V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.													



Emission below 1GHz

5GHz WIFI 802.11n HT20 (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		( MHz )	( dBμV/m )	( dB )	( dBμV/m )	( dBμV )	( dB/m )	( dB )	( dB )	( cm )	( deg )	( P/A )	( H/V )	
5GHz 802.11n HT20 LF		142.32	32.18	-11.32	43.5	48.51	14.72	1.19	32.28	-	-	P	H	
		160.95	36.84	-6.66	43.5	55.48	12.31	1.27	32.28	100	0	P	H	
		172.56	29.85	-13.65	43.5	48.69	12.02	1.35	32.28	-	-	P	H	
		600.3	32.82	-13.18	46	39.8	22.71	2.42	32.21	-	-	P	H	
		750.1	31.71	-14.29	46	35.97	25.04	2.68	32.08	-	-	P	H	
		874.7	36.91	-9.09	46	39.38	26.14	2.9	31.63	-	-	P	H	
														H
														H
														H
														H
														H
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														H
														H
														H
														H
			31.89	34.94	-5.06	40	45.74	20.97	0.59	32.34	100	0	P	V
			86.16	28.41	-11.59	40	49.63	10.09	0.95	32.3	-	-	P	V
		155.82	29.69	-13.81	43.5	47.54	13.1	1.27	32.28	-	-	P	V	
		600.3	28.86	-17.14	46	35.84	22.71	2.42	32.21	-	-	P	V	
		750.1	31.33	-14.67	46	35.59	25.04	2.68	32.08	-	-	P	V	
		885.9	34.58	-11.42	46	36.9	26.21	2.94	31.58	-	-	P	V	
													V	
													V	
													V	
													V	
													V	
													V	
													V	
<b>Remark</b>	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>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”.



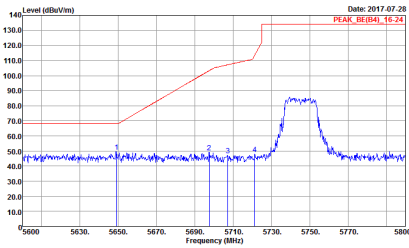
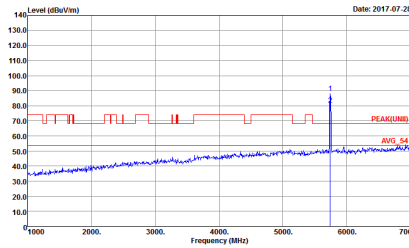
## Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Alex Jheng, Bill Chang and Wilson Wu	Temperature :	24.5~25.3°C
		Relative Humidity :	49~51%

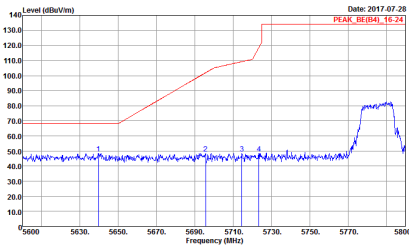
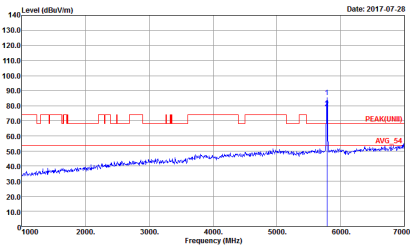
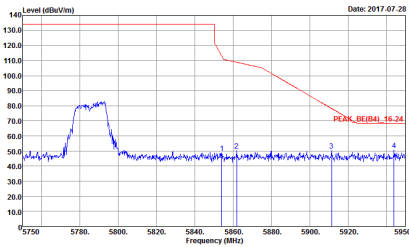
**Band 4 - 5725~5850MHz**  
**WIFI 802.11a (Band Edge @ 3m)**

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Fundamental
Peak	<p>           Date: 2017.07.28            PEAK_BE(B4)_16-24         </p> <p>           Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            Detector : Peak            Project : 581010-04            Mode : 1            Power : 28         </p>	<p>           Date: 2017.07.28            PEAK(UMB)            AVS_54         </p> <p>           Site : 03CH13-HY            Condition : PEAK(UMB) 3m HORN_91200_1241 HORIZONTAL            Detector : Peak            Project : 581010-04            Mode : 1            Power : 28         </p>

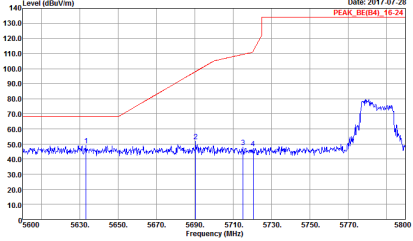
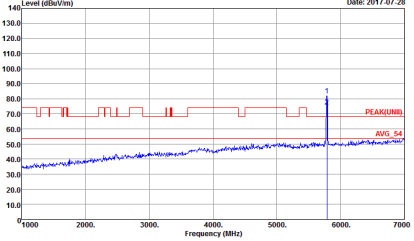
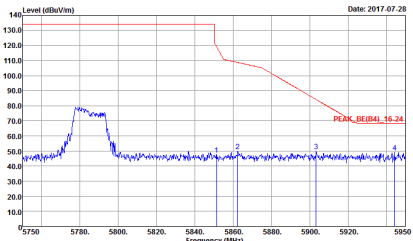


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH149 5745MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 1            Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK(UNB) 3m HORN_91200_1241 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 1            Power : 28</p>

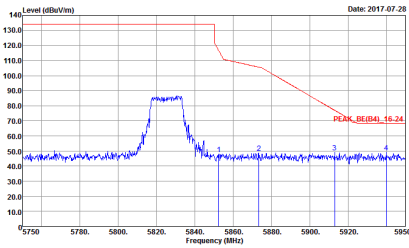
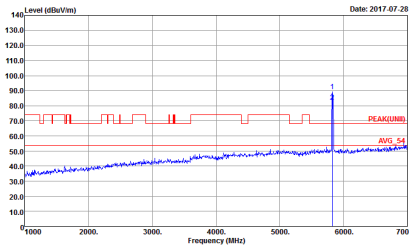


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 2            Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK(UNB) 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 2            Power : 28</p>
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 2            Power : 28</p>	Left blank

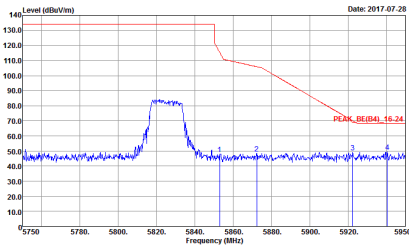
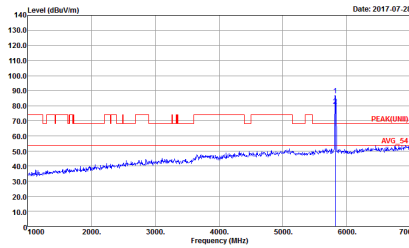


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH157 5785MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28 PEAK_BE(B4)_16-24</p> <p>Site : 03CH13-HY Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 581010-04 Mode : 2 Power : 28</p>	 <p>Date: 2017.07.28 PEAK(UNB) AVG 54</p> <p>Site : 03CH13-HY Condition : PEAK(UNB) 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 581010-04 Mode : 2 Power : 28</p>
Peak	 <p>Date: 2017.07.28 PEAK_BE(B4)_16-24</p> <p>Site : 03CH13-HY Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL RBW:1000.000KHz VBW:3000.000KHz SWT:Auto Detector : Peak Project : 581010-04 Mode : 2 Power : 28</p>	Left blank



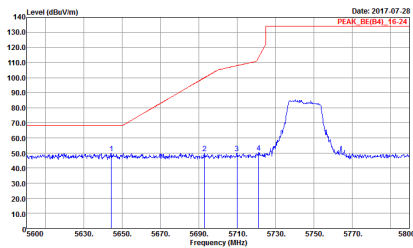
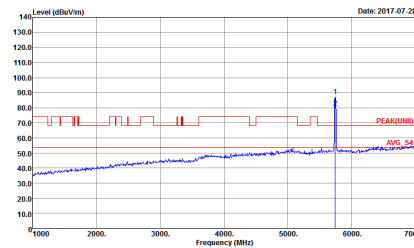
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 3  Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK(UNB) 3m HORN_91200_1241 HORIZONTAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 3  Power : 28</p>



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11a CH165 5825MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 3  Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK(UNII) 3m HORN_91200_1241 VERTICAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 3  Power : 28</p>

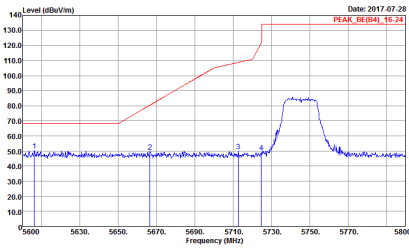
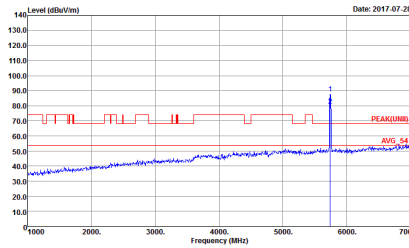


**Band 4 5725~5850MHz**  
**WIFI 802.11n HT20 (Band Edge @ 3m)**

WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Fundamental
<p><b>Peak</b></p>	 <p>Date: 2017.07.28 PEAK_BE(B4)_16-21</p> <p>Site : 03CH13-HY  Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL  Detector : Peak  Project : 581010-04  Mode : 4  Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK(UNIT) 3m HORN_91200_1241 HORIZONTAL  Detector : Peak  Project : 581010-04  Mode : 4  Power : 28</p>



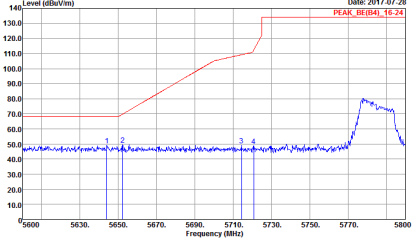
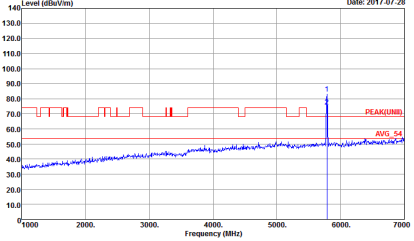
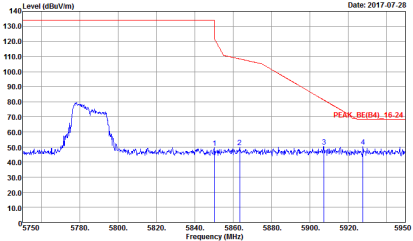


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY          Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL          Detector : Peak          Project : 581010-04          Mode : 4          Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY          Condition : PEAK(UNL) 3m HORN_91200_1241 VERTICAL          Detector : Peak          Project : 581010-04          Mode : 4          Power : 28</p>

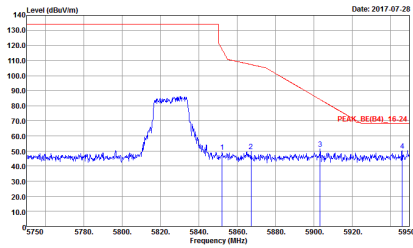
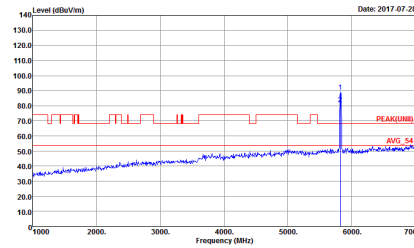


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Fundamental
<p><b>Peak</b></p>	<p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>	<p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK(UNB) 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>
<p><b>Peak</b></p>	<p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>	<p>Left blank</p>

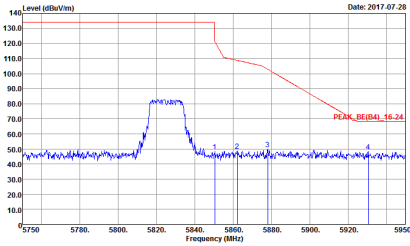
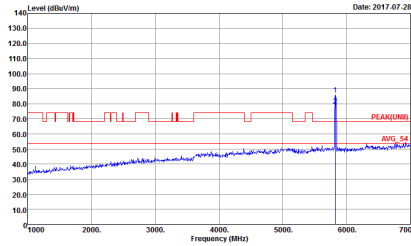


WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK(UNB) 3m HORN_91200_1241 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL            : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto            Detector : Peak            Project : 581010-04            Mode : 5            Power : 28</p>	Left blank



WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Fundamental
Peak	 <p>Site : 03CH13-HY            Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 HORIZONTAL            Detector : Peak            Project : 581010-04            Mode : 6            Power : 28</p>	 <p>Site : 03CH13-HY            Condition : PEAK(UNB) 3m HORN_91200_1241 HORIZONTAL            Detector : Peak            Project : 581010-04            Mode : 6            Power : 28</p>



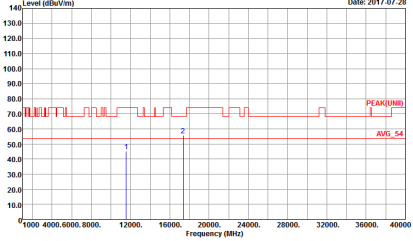
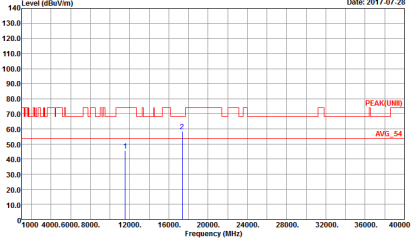
WIFI	Band 4 5725~5850MHz Band Edge @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Vertical	Fundamental
Peak	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK_BE(B4)_16-24 3m HORN_91200_1241 VERTICAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 6  Power : 28</p>	 <p>Date: 2017.07.28</p> <p>Site : 03CH13-HY  Condition : PEAK(UNII) 3m HORN_91200_1241 VERTICAL  : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto  Detector : Peak  Project : 581010-04  Mode : 6  Power : 28</p>



**Band 4 - 5725~5850MHz**  
**WIFI 802.11a (Harmonic @ 3m)**

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11a CH149 5745MHz	
1	Horizontal	Vertical
<p><b>Peak</b></p> <p><b>Avg.</b></p>	<p>Site : 03CH3-HY  Condition : PEAK(UNB) 3m SHF_HORN_584 HORIZONTAL  Detector : Peak  Project : 581010-04  Mode : 11  Power : 28</p>	<p>Site : 03CH3-HY  Condition : PEAK(UNB) 3m SHF_HORN_584 VERTICAL  Detector : Peak  Project : 581010-04  Mode : 11  Power : 28</p>



WIFI	Band 4 5725-5850MHz Harmonic @ 3m	
ANT	802.11a CH157 5785MHz	
1	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH13-HY Condition : PEA(U)N(I) 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 581010-04 Mode : 2 Power : 28</p>	 <p>Site : 03CH13-HY Condition : PEA(U)N(I) 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 581010-04 Mode : 2 Power : 28</p>

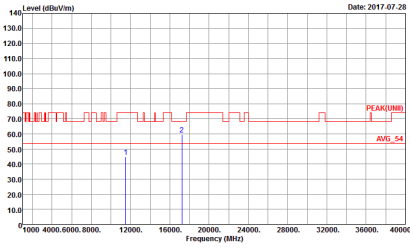
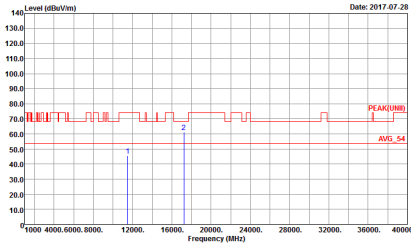


WIFI	Band 4 5725-5850MHz Harmonic @ 3m	
ANT	802.11a CH165 5825MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	<p>Site : 03CH13-HY          Condition : PEA(U)N(I) 3m SHF_HORN_584 HORIZONTAL          Detector : Peak          Project : 581010-04          Mode : 3          Power : 28</p>	<p>Site : 03CH13-HY          Condition : PEA(U)N(I) 3m SHF_HORN_584 VERTICAL          Detector : Peak          Project : 581010-04          Mode : 3          Power : 28</p>





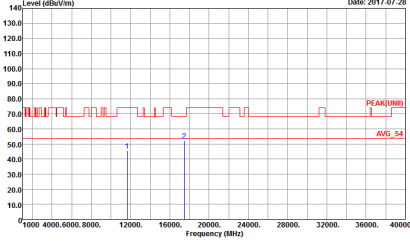
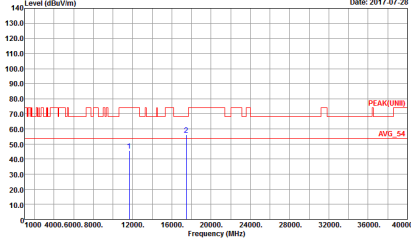
**Band 4 5725~5850MHz**  
**WIFI 802.11n HT20 (Harmonic @ 3m)**

WIFI	Band 4 5725~5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH149 5745MHz	
1	Horizontal	Vertical
<p><b>Peak</b></p> <p><b>Avg.</b></p>	 <p>Site : 03CH13-HY            Condition : PEAK(UNII) 3m SHF_HORN_584 HORIZONTAL            Detector : Peak            Project : 581010-04            Mode : 4            Power : 28</p>	 <p>Site : 03CH13-HY            Condition : PEAK(UNII) 3m SHF_HORN_584 VERTICAL            Detector : Peak            Project : 581010-04            Mode : 4            Power : 28</p>



WIFI	Band 4 5725-5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH157 5785MHz	
1	Horizontal	Vertical
<p>Peak</p> <p>Avg.</p>	<p>Site : 03CH13-HY          Condition : PEAK(UNII) 3m SHF_HORN_584 HORIZONTAL          Detector : Peak          Project : 581010-04          Mode : 15          Power : 28</p>	<p>Site : 03CH13-HY          Condition : PEAK(UNII) 3m SHF_HORN_584 VERTICAL          Detector : Peak          Project : 581010-04          Mode : 15          Power : 28</p>



WIFI	Band 4 5725-5850MHz Harmonic @ 3m	
ANT	802.11n HT20 CH165 5825MHz	
1	Horizontal	Vertical
Peak Avg.	 <p>Site : 03CH13-HY Condition : PEAK(UNII) 3m SHF_HORN_584 HORIZONTAL Detector : Peak Project : 581010-04 Mode : 16 Power : 28</p>	 <p>Site : 03CH13-HY Condition : PEAK(UNII) 3m SHF_HORN_584 VERTICAL Detector : Peak Project : 581010-04 Mode : 16 Power : 28</p>



Emission below 1GHz  
5GHz WIFI 802.11a (LF)

WIFI	5GHz 5725~5850MHz	
ANT	802.11a LF	
1	Horizontal	Vertical
QP / Peak	<p>Site : 03CH13-14Y Condition : QP 3m BILOG_40103 HORIZONTAL Detector : Peak Project : 581010-04 Mode : 7</p>	<p>Site : 03CH13-14Y Condition : QP 3m BILOG_40103 VERTICAL Detector : Peak Project : 581010-04 Mode : 7</p>



Emission below 1GHz
5GHz WIFI 802.11n HT20 (LF)

Table with 2 columns: Horizontal and Vertical. Each column contains a spectral plot of Level (dBuV/m) vs Frequency (MHz) from 50 to 1000 MHz. The plots show emission levels with a red QP marker at 1000 MHz. Metadata includes Site, Condition, Detector, Project, and Mode.

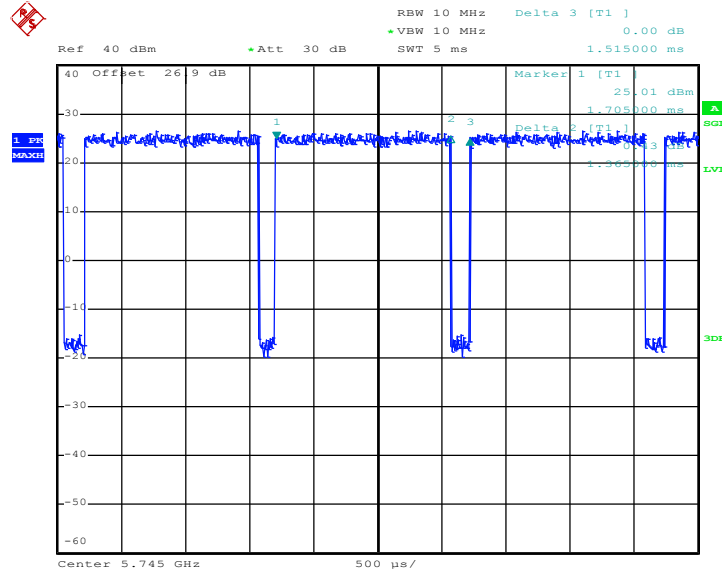


## Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
802.11a	90.10	1365	0.73	1kHz
5GHz 802.11n HT20	90.04	1265	0.79	1kHz

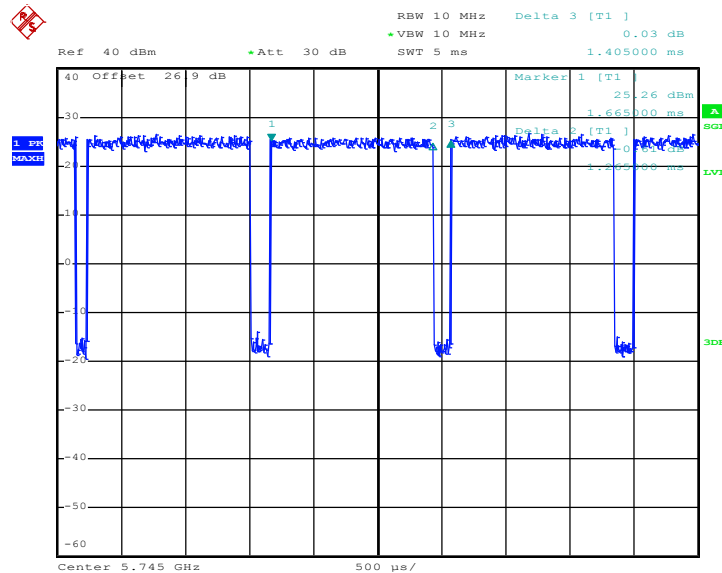


802.11a



Date: 1.AUG.2017 21:19:02

802.11n HT20



Date: 1.AUG.2017 21:36:41