

## FCC TEST REPORT

For

Honest Technology

Module

Model No.: HT-WiFi B02

Prepared for : Honest Technology  
Address : Kyung-Dong Bldg., 5F, 906-5, Jijok-Dong, Yuseong-Gu, Daejeon,  
South Korea

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.  
Address : 1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd., Bao'an  
District, Shenzhen, Guangdong, China

Date of receipt of test sample : December 15, 2014  
Number of tested samples : 1  
Serial number : Prototype  
Date of Test : December 15, 2014 - December 23, 2014  
Date of Report : December 23, 2014

**FCC TEST REPORT**  
**FCC CFR 47 PART 15 E(15.407)****Report Reference No. .... : LCS1412221112E**

Date of Issue ..... : December 23, 2014

**Testing Laboratory Name ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.**Address ..... : 1F., Xingyuan Industrial Park, Tongda Road, Bao'an Blvd.,  
Bao'an District, Shenzhen, Guangdong, ChinaTesting Location/ Procedure..... : Full application of Harmonised standards ☒  
Partial application of Harmonised standards ☐  
Other standard testing method ☐**Applicant's Name..... : Honest Technology**Address ..... : Kyung-Dong Bldg., 5F, 906-5, Jijok-Dong, Yuseong-Gu,  
Daejeon, South Korea**Test Specification**

Standard ..... : FCC CFR 47 PART 15 E(15.407)

**Test Report Form No..... : LCSEMC-1.0**

TRF Originator ..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF ..... : Dated 2011-03

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**Test Item Description. .... : Module**

Trade Mark ..... : HT

Model/ Type reference..... : HT-WiFi B02

Ratings ..... : DC 5.0V,460mA

Result ..... : **Positive****Compiled by:**

Jacky Li/ File administrators

**Supervised by:**

Danny Huang/ Technique principal

**Approved by:**

Gavin Liang/ Manager

**FCC -- TEST REPORT****Test Report No. : LCS1412221112E**December 23, 2014

Date of issue

Type / Model..... : HT-WiFi B02

EUT..... : Module

**Applicant..... : Honest Technology**Address..... : Kyung-Dong Bldg., 5F, 906-5, Jijok-Dong, Yuseong-Gu, Daejeon,  
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Telephone..... : /

Fax..... : /

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Shiyan Street,Baoan District,Shenzhen.GD.China.

Telephone..... : /

Fax..... : /

**Test Result:****Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

EUT : Module

Model Number : HT-WiFi B02

Power Supply : DC 5.0V,460mA

Frequency Range : 5180.00-5240.00MHz

Channel Number : 4 Channels for 5180.00-5240.00MHz

Modulation Technology : IEEE 802.11a: OFDM (64QAM, 16QAM,QPSK,BPSK)

Data Rates : IEEE 802.11a: 6-54Mbps

Antenna Gain : Integral antenna  
Chain 0: 5.0dBi(Max.)  
Chain 1: 5.0dBi(Max.)

## 1.2. Host System Configuration List and Details

| Manufacturer | Description | Model | Serial Number | Certificate |
|--------------|-------------|-------|---------------|-------------|
| Lenovo       | Notebook    | B470  | --            | DoC         |

## 1.3. External I/O Port

| I/O Port Description | Quantity | Cable |
|----------------------|----------|-------|
| --                   | --       | --    |

## 1.4. Description of Test Facility

### Site Description

#### EMC Lab.

: Accredited by CNAS, June 04, 2010  
The Certificate Registration Number. is L4595.  
Accredited by FCC, July 14, 2011  
The Certificate Registration Number. is 899208.  
Accredited by Industry Canada, May. 02, 2011  
The Certificate Registration Number. is 9642A-1  
Accredited by VCCI, Japan January 30, 2012  
The Certificate Registration Number. is C-4260 and R-3804  
Accredited by ESMD, April 24, 2012  
The Certificate Registration Number. is ARCB0108.  
Accredited by UL, June 11, 2012  
The Certificate Registration Number. is 100571-492.  
Accredited by TUV, November 21, 2012  
The Certificate Registration Number. is SCN1081  
Accredited by Intertek, December 21, 2012  
The Certificate Registration Number. is 2011-RTL-L1-50.

## 1.5. Statement of The Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

## 1.6. Measurement Uncertainty

| Test Item              |   | Frequency Range | Uncertainty         | Note |
|------------------------|---|-----------------|---------------------|------|
| Radiation Uncertainty  | : | 9KHz~30MHz      | $\pm 3.10\text{dB}$ | (1)  |
|                        |   | 30MHz~200MHz    | $\pm 2.96\text{dB}$ | (1)  |
|                        |   | 200MHz~1000MHz  | $\pm 3.10\text{dB}$ | (1)  |
|                        |   | 1GHz~26.5GHz    | $\pm 3.80\text{dB}$ | (1)  |
|                        |   | 26.5GHz~40GHz   | $\pm 3.90\text{dB}$ | (1)  |
| Conduction Uncertainty | : | 150kHz~30MHz    | $\pm 1.63\text{dB}$ | (1)  |
| Power disturbance      | : | 30MHz~300MHz    | $\pm 1.60\text{dB}$ | (1)  |

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

## 1.7. Description Of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

802.11a Mode : 6 Mbps, OFDM.

### Antenna & Bandwidth

| Antenna        | Single (Port.1)          |                          | Two (Port.1 + Port.2)               |                          |
|----------------|--------------------------|--------------------------|-------------------------------------|--------------------------|
| Bandwidth Mode | 20MHz                    | 40MHz                    | 20MHz                               | 40MHz                    |
| 802.11a        | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

## 2. TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

The radiated testing was performed at an antenna-to-EUT distance of 3 meters. All radiated and conducted emissions measurement was performed at Shenzhen LCS Compliance Testing Laboratory Ltd..

### 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### 2.2. EUT Exercise

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

According to FCC's request, Test Procedure KDB789033 and KDB 6622911 are required to be used for this kind of FCC 15.407 UII device.

According to its specifications, the EUT must comply with the requirements of the Section 15.203, 15.205, 15.207, 15.209 and 15.407 under the FCC Rules Part 15 Subpart E

### 2.3. General Test Procedures

#### 2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements of ANSI C63.4 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements of ANSI C63.4

### **3. SYSTEM TEST CONFIGURATION**

#### **3.1. Justification**

The system was configured for testing in a continuous transmit condition.

#### **3.2. EUT Exercise Software**

N/A

#### **3.3. Special Accessories**

N/A

#### **3.4. Block Diagram/Schematics**

Please refer to the related document

#### **3.5. Equipment Modifications**

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

#### **3.6. Test Setup**

Please refer to the test setup photo.

## 4. SUMMARY OF TEST RESULTS

| Applied Standard: FCC Part 15 Subpart E |                                |           |
|-----------------------------------------|--------------------------------|-----------|
| FCC Rules                               | Description of Test            | Result    |
| §15.407(a)                              | Maximum Conducted Output Power | Compliant |
| §15.407(a)                              | Power Spectral Density         | Compliant |
| §15.407(a)                              | 26dB Bandwidth                 | Compliant |
| §15.407(a)                              | 99% Occupied Bandwidth         | Compliant |
| §15.407(a)                              | Peak Excursion                 | Compliant |
| §15.407(b)                              | Radiated Emissions             | Compliant |
| §15.407(b)                              | Band edge Emissions            | Compliant |
| §15.205                                 | Emissions at Restricted Band   | Compliant |
| §15.407(g)                              | Frequency Stability            | Compliant |
| §15.207(a)                              | Line Conducted Emissions       | Compliant |
| §15.203                                 | Antenna Requirements           | Compliant |
| §2.1093                                 | RF Exposure                    | Compliant |

## 5. TEST RESULT

### 5.1. Maximum Conducted Output Power Measurement

#### 5.1.1. Standard Applicable

##### **For 5180~5240MHz**

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 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

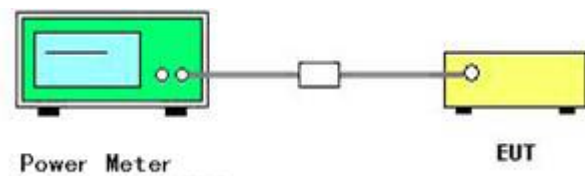
#### 5.1.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of the power meter.

#### 5.1.3. Test Procedures

The transmitter output (antenna port) was connected to the power sensor. Read the test result from the power meter and record it.

#### 5.1.4. Test Setup Layout



#### 5.1.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.1.6. Test Result of Maximum Conducted Output Power

|               |       |                |         |
|---------------|-------|----------------|---------|
| Temperature   | 25°C  | Humidity       | 60%     |
| Test Engineer | Jacky | Configurations | 802.11a |

## 802.11a/Port.1

| Channel | Frequency<br>(MHz) | AV Conducted Power<br>(dBm) |        | Sum<br>Power<br>(dBm) | Max. Limit<br>(dBm) | Result   |
|---------|--------------------|-----------------------------|--------|-----------------------|---------------------|----------|
|         |                    | Chain0                      | Chain1 |                       |                     |          |
| 36      | 5180               | 17.63                       | 18.81  | 21.27                 | 30                  | Complies |
| 40      | 5200               | 17.61                       | 18.26  | 20.96                 | 30                  | Complies |
| 48      | 5240               | 17.06                       | 18.03  | 20.58                 | 30                  | Complies |

## 5.2. Power Spectral Density Measurement

### 5.2.1. Standard Applicable

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The power spectral density limits as show follow.

| Frequency range(MHz) | Power Spectral Density Limit |
|----------------------|------------------------------|
| 5150~5250            | 17 dBm/MHz                   |

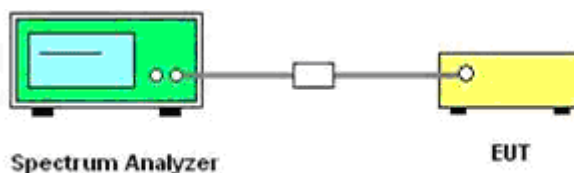
### 5.2.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of Spectrum Analyzer.

### 5.2.3. Test Procedures

1. The transmitter was connected directly to a Spectrum Analyzer through a directional couple.
2. The power was monitored at the coupler port with a Spectrum Analyzer. The power level was set to the maximum level.
3. Set the RBW = 1000 kHz.
4. Set the VBW  $\geq 3 \times$  RBW
5. Span=Encompass the entire emissions bandwidth (EBW) of the signal
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum power level in any 1MHz band segment within the fundamental EBW.

### 5.2.4. Test Setup Layout



### 5.2.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.2.6. Test Result of Power Spectral Density

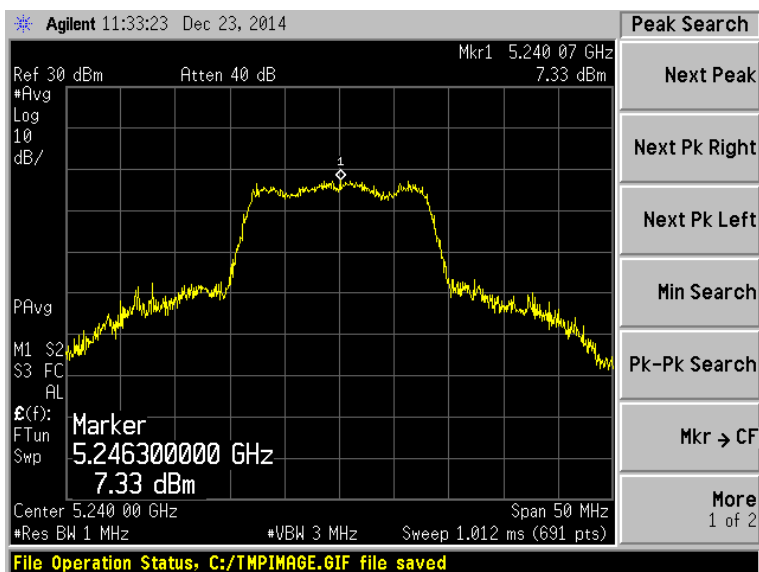
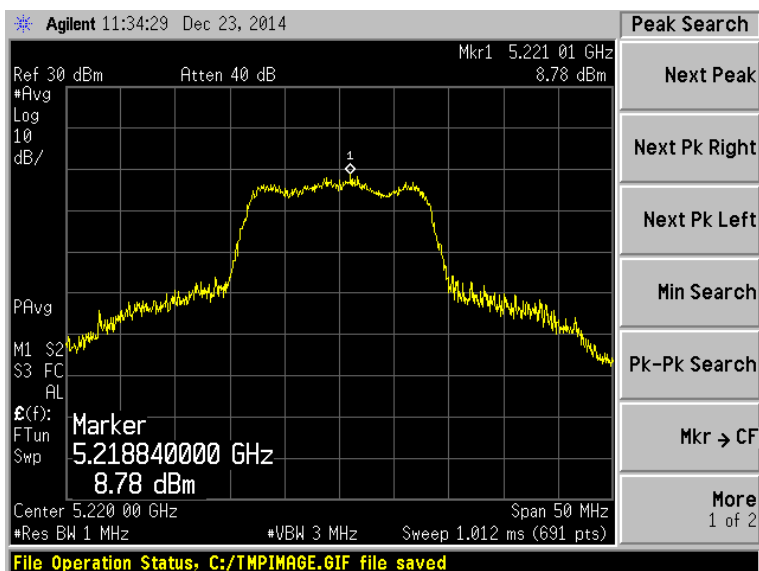
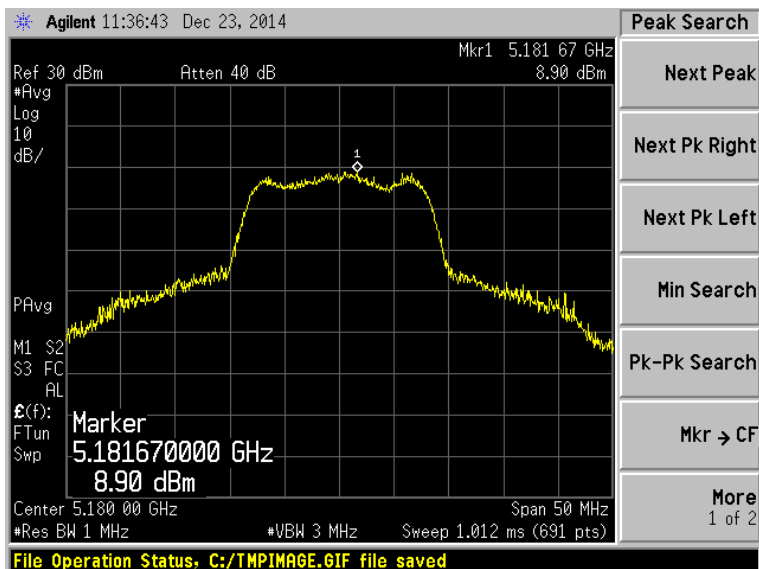
|               |       |                |         |
|---------------|-------|----------------|---------|
| Temperature   | 25°C  | Humidity       | 60%     |
| Test Engineer | Jacky | Configurations | 802.11a |

802.11a

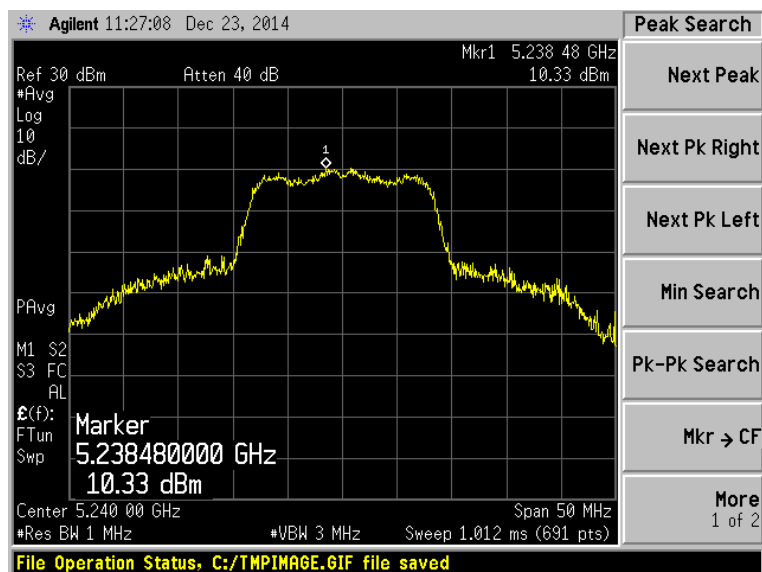
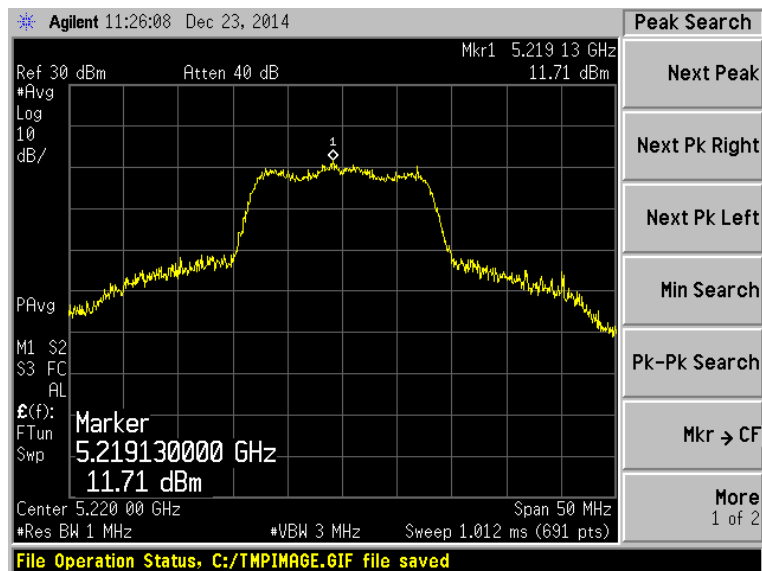
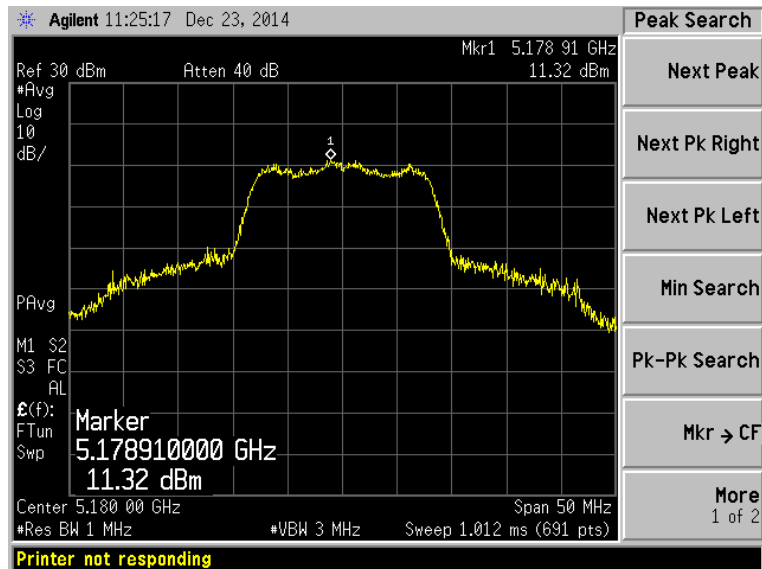
| Channel | Frequency (MHz) | Power Density (dBm/MHz) |        | Duty cycle factor(dB) | Sum PSD (dBm/MHz) | Max. Limit (dBm/MHz) | Result   |
|---------|-----------------|-------------------------|--------|-----------------------|-------------------|----------------------|----------|
|         |                 | Chain0                  | Chain1 |                       |                   |                      |          |
| 36      | 5180            | 8.90                    | 11.32  | 1.31                  | 14.60             | 17                   | Complies |
| 40      | 5200            | 8.78                    | 11.71  | 1.31                  | 14.81             | 17                   | Complies |
| 48      | 5240            | 7.33                    | 10.33  | 1.31                  | 13.40             | 17                   | Complies |

Duty cycle factor=10log(Ton/Tperiod)=10log[1/(496.7/671.7)]dB =1.31dB

## 802.11a channel power density-Chain 0



## 802.11a channel power density-Chain 1



### 5.3. 99% and 26dB Occupied Bandwidth Measurement

#### 5.3.1. Standard Applicable

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

#### 5.3.2. Measuring Instruments and Setting

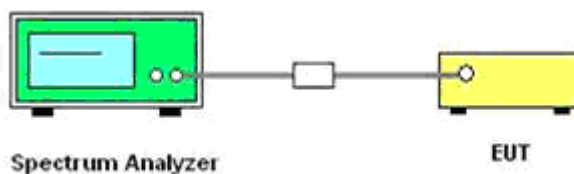
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

| Spectrum Parameter | Setting          |
|--------------------|------------------|
| Attenuation        | Auto             |
| Span               | > 26dB Bandwidth |
| Detector           | Peak             |
| Trace              | Max Hold         |
| Sweep Time         | 100ms            |

#### 5.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 300 kHz and the video bandwidth of 1000 kHz were used.
3. Measured the spectrum width with power higher than 26dB below carrier.

#### 5.3.4. Test Setup Layout



#### 5.3.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.3.6. Test Result of 99% and 26dB Occupied Bandwidth

|               |       |                |         |
|---------------|-------|----------------|---------|
| Temperature   | 25°C  | Humidity       | 60%     |
| Test Engineer | Jacky | Configurations | 802.11a |

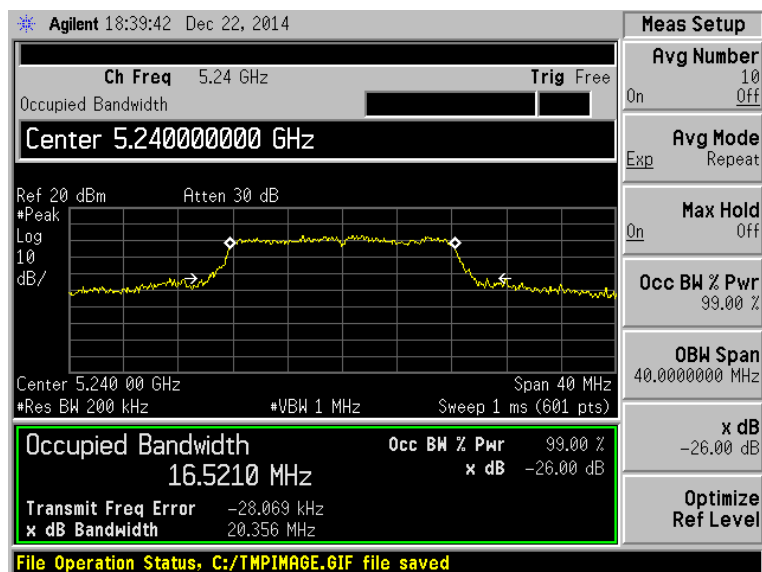
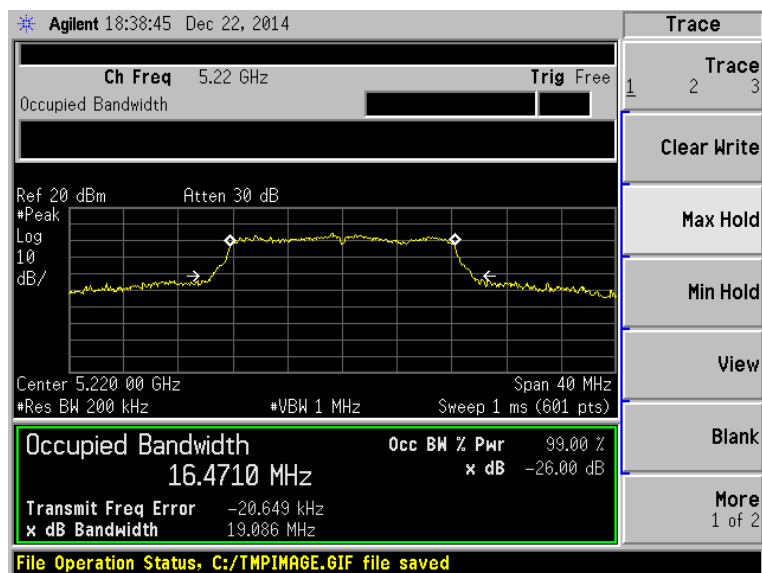
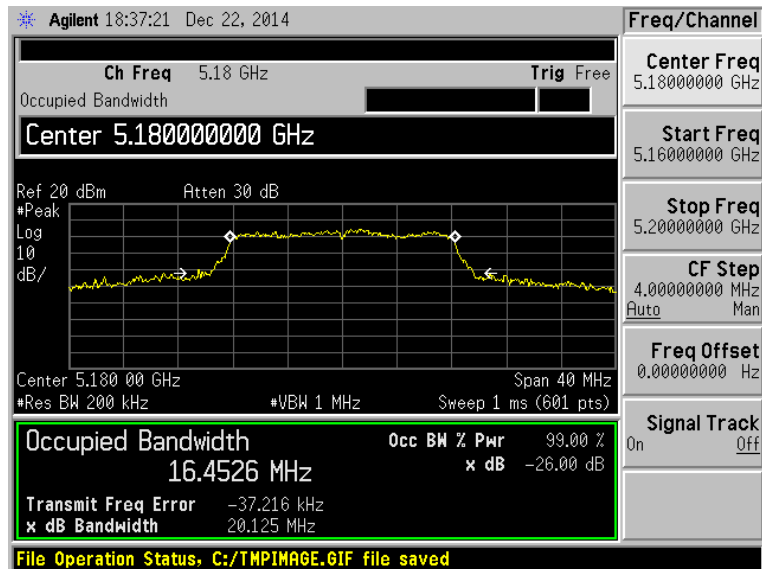
## 802.11a-Chain 0

| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---------|-----------------|----------------------|------------------------------|
| 36      | 5180            | 20.125               | 16.4526                      |
| 40      | 5200            | 19.086               | 16.4710                      |
| 48      | 5240            | 20.356               | 16.5210                      |

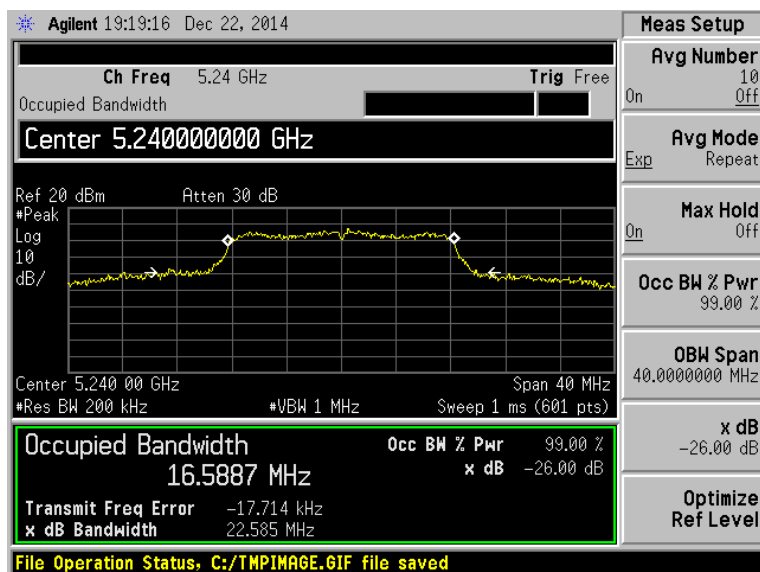
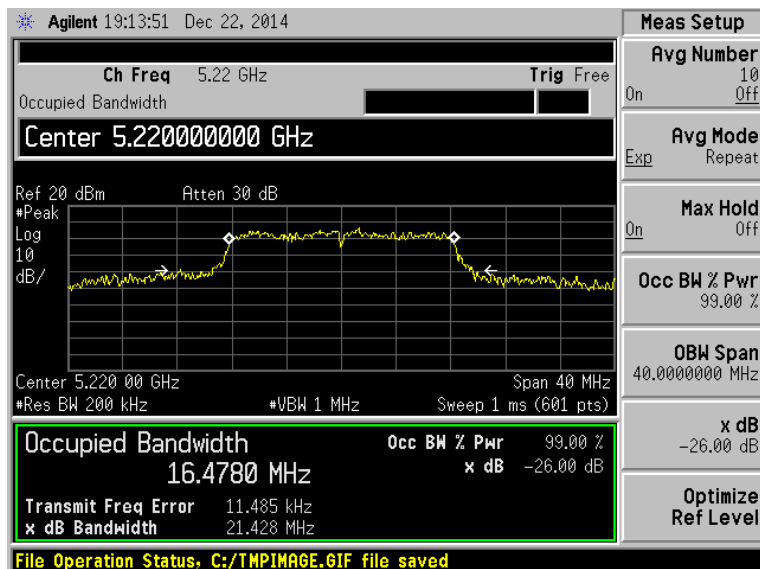
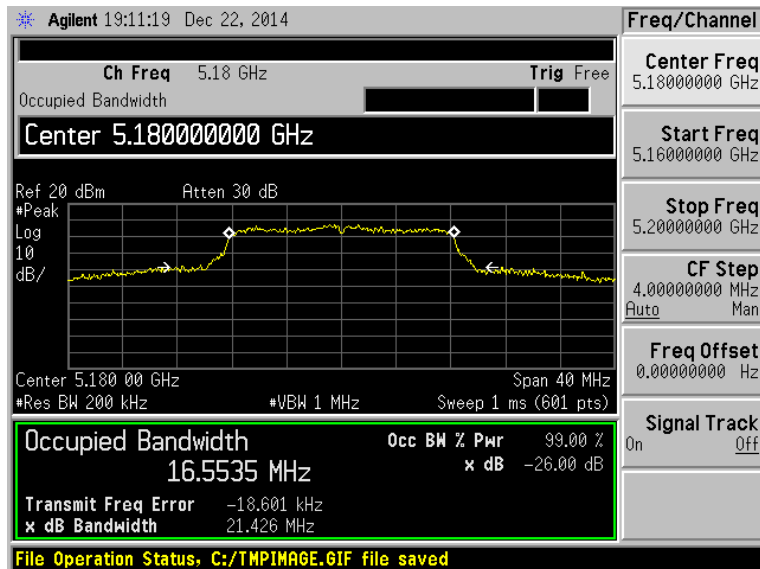
## 802.11a-Chain 1

| Channel | Frequency (MHz) | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---------|-----------------|----------------------|------------------------------|
| 36      | 5180            | 21.426               | 16.5535                      |
| 40      | 5200            | 21.428               | 16.4780                      |
| 48      | 5240            | 22.585               | 16.5887                      |

## 802.11a 99% and 26dB Occupied Bandwidth -Chain 0



## 802.11a 99% and 26dB Occupied Bandwidth -Chain 1



## 5.4. Peak Excursion Measurement

### 5.4.1. Standard Applicable

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emissions bandwidth whichever is less.

### 5.4.2. Measuring Instruments and Setting

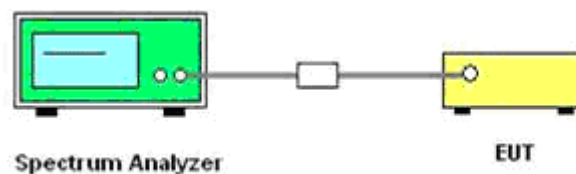
Please refer to section 6 of equipments list in this report. The following table is the setting of the Spectrum Analyzer.

| Spectrum Parameter | Setting                                                      |
|--------------------|--------------------------------------------------------------|
| Attenuation        | Auto                                                         |
| Span Frequency     | Encompass the entire emissions bandwidth (EBW) of the signal |
| RBW                | 1000 kHz (Peak Trace) / 1000 kHz (Average Trace)             |
| VBW                | 3000 kHz (Peak Trace) / 300 kHz (Average Trace)              |
| Detector           | Peak (Peak Trace) / Sample (Average Trace)                   |
| Trace              | Max Hold                                                     |
| Sweep Time         | Auto                                                         |

### 5.4.3. Test Procedures

1. The transmitter output is connected to the spectrum analyzer.
2. Trace A, Set RBW =1MHz, VBW = 3MHz, Span >26dB bandwidth, Max. hold.
3. Delta Mark trace A Maximum frequency and trace B same frequency.
4. Repeat the above procedure until measurements for all frequencies were complete.

### 5.4.4. Test Setup Layout



### 5.4.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.4.6. Test Result of Peak Excursion

|               |       |                |         |
|---------------|-------|----------------|---------|
| Temperature   | 25°C  | Humidity       | 60%     |
| Test Engineer | Jacky | Configurations | 802.11a |

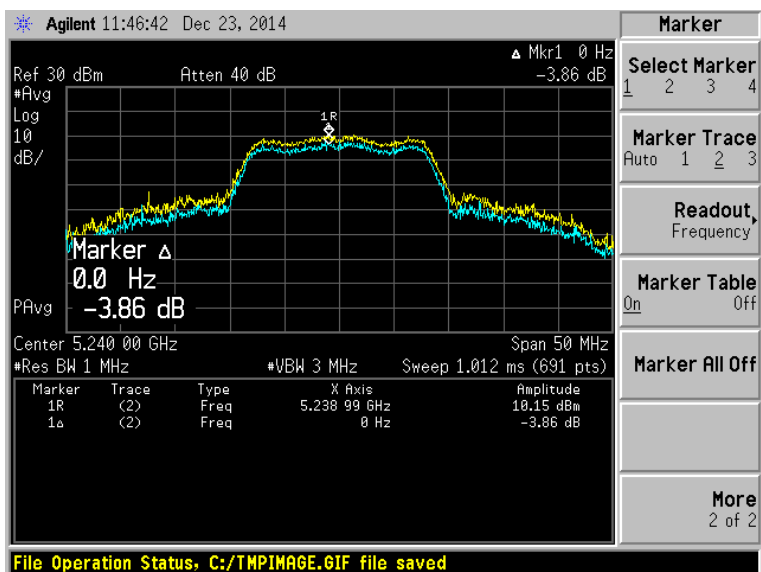
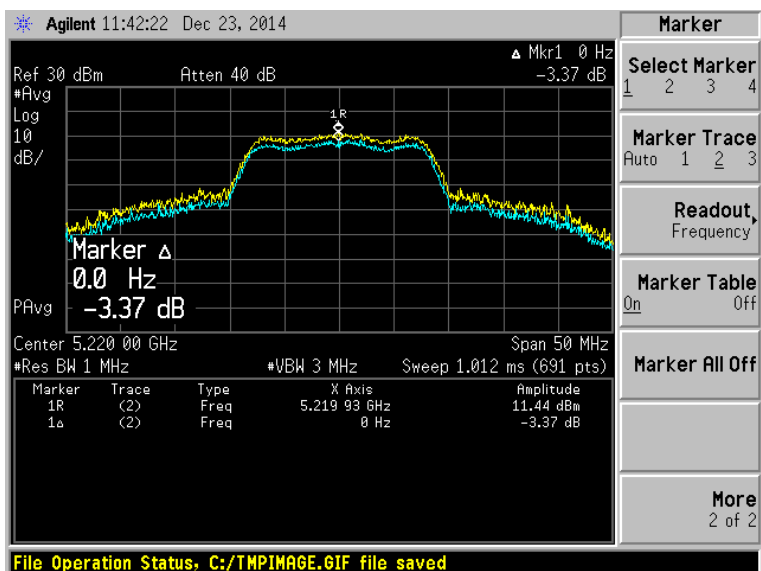
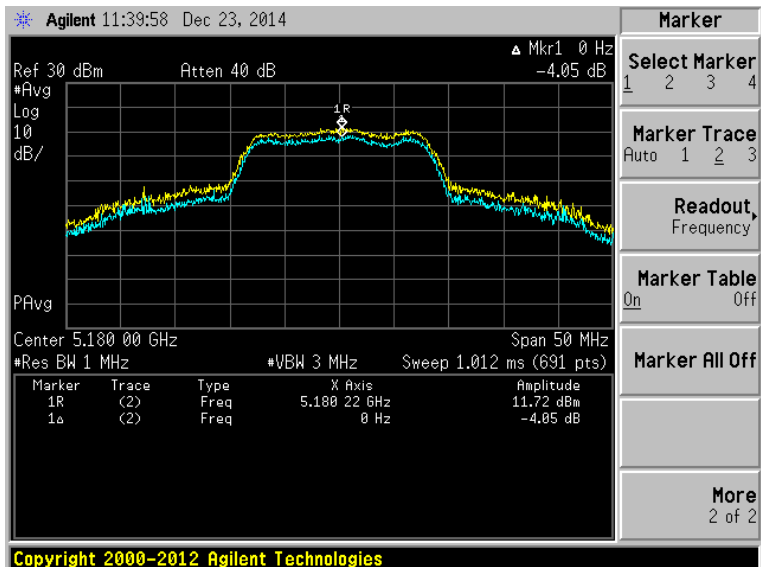
## 802.11a-Chain 0

| Channel | Frequency (MHz) | Peak Excursion (dB) | Max. Limit (dB) | Result   |
|---------|-----------------|---------------------|-----------------|----------|
| 36      | 5180            | 4.05                | 13              | Complies |
| 40      | 5200            | 3.37                | 13              | Complies |
| 48      | 5240            | 3.86                | 13              | Complies |

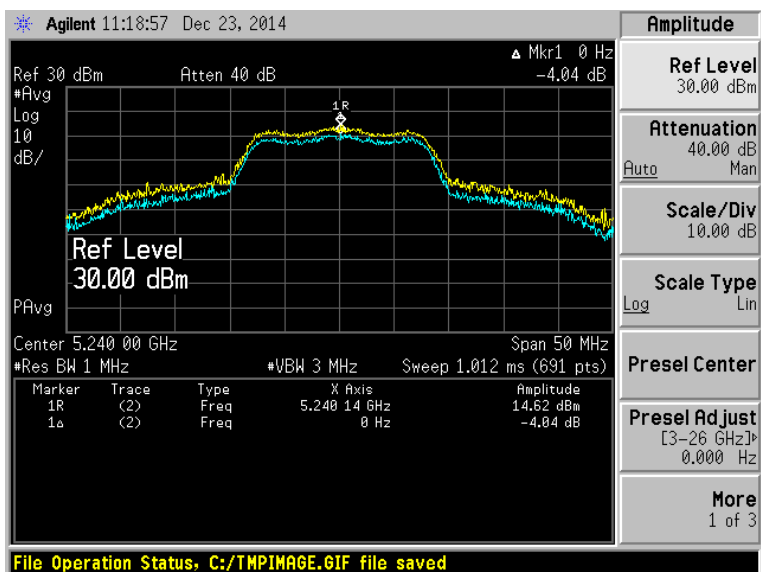
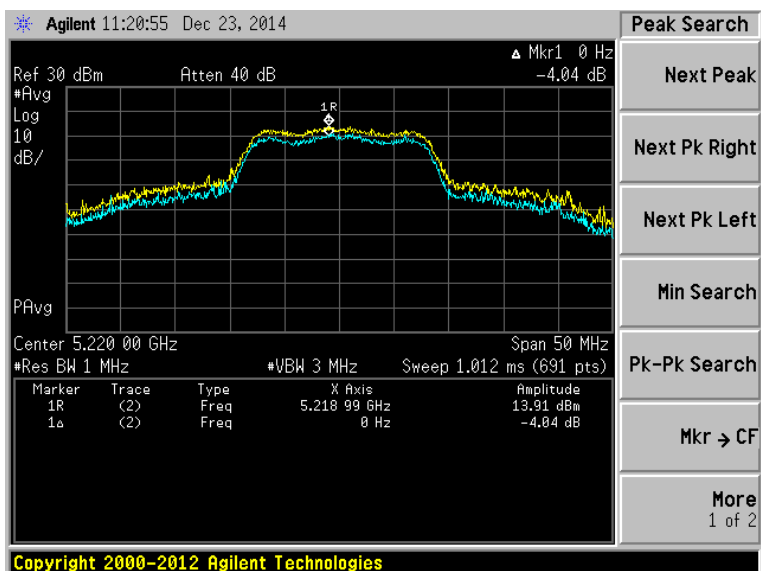
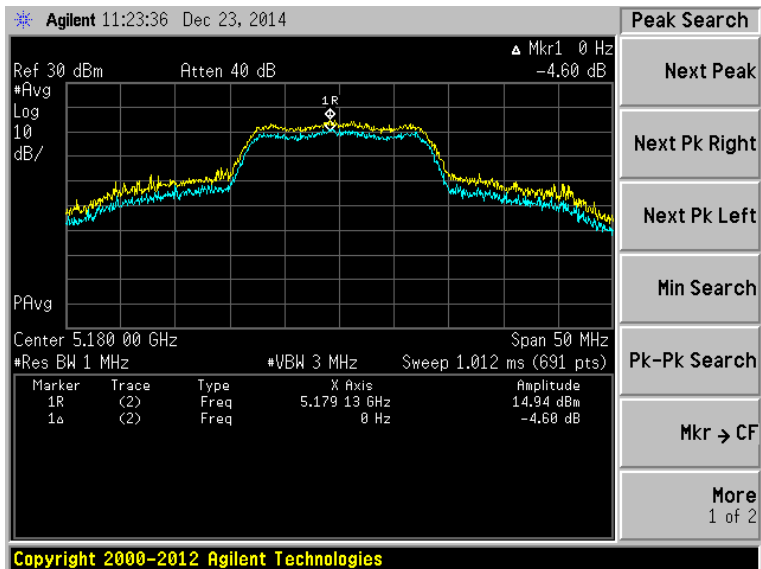
## 802.11a-Chain 1

| Channel | Frequency (MHz) | Peak Excursion (dB) | Max. Limit (dB) | Result   |
|---------|-----------------|---------------------|-----------------|----------|
| 36      | 5180            | 4.60                | 13              | Complies |
| 40      | 5200            | 4.04                | 13              | Complies |
| 48      | 5240            | 3.04                | 13              | Complies |

## 802.11a-Chain 0



## 802.11a-Chain 1



## 5.5. Radiated Emissions Measurement

### 5.5.1. Standard Applicable

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.470-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.725-5.825 GHz 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 (78.3dBuV/m at 3m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies(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                            |

### 5.5.2. Measuring Instruments and Setting

Please refer to section 6 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

| Spectrum Parameter                        | Setting                                        |
|-------------------------------------------|------------------------------------------------|
| Attenuation                               | Auto                                           |
| Start Frequency                           | 1000 MHz                                       |
| Stop Frequency                            | 10th carrier harmonic                          |
| RB / VB (Emission in restricted band)     | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |
| RB / VB (Emission in non-restricted band) | 1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average |

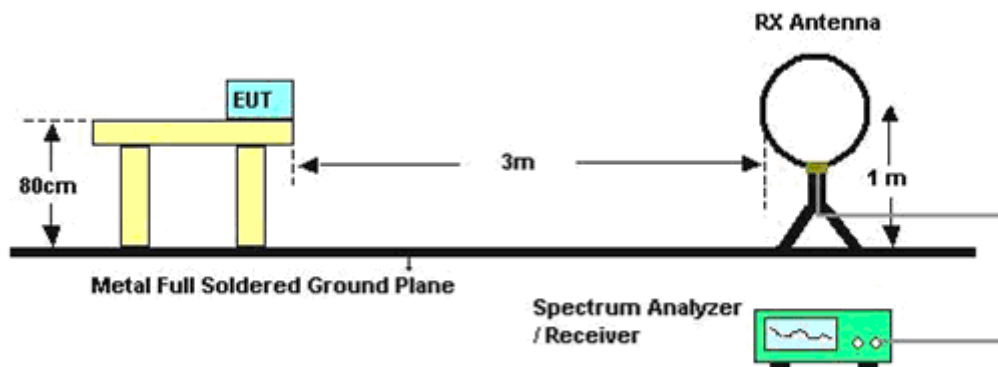
| Receiver Parameter     | Setting                          |
|------------------------|----------------------------------|
| Attenuation            | Auto                             |
| Start ~ Stop Frequency | 9kHz~150kHz / RB 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RB 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RB 100kHz for QP |

### 5.5.3. Test Procedures

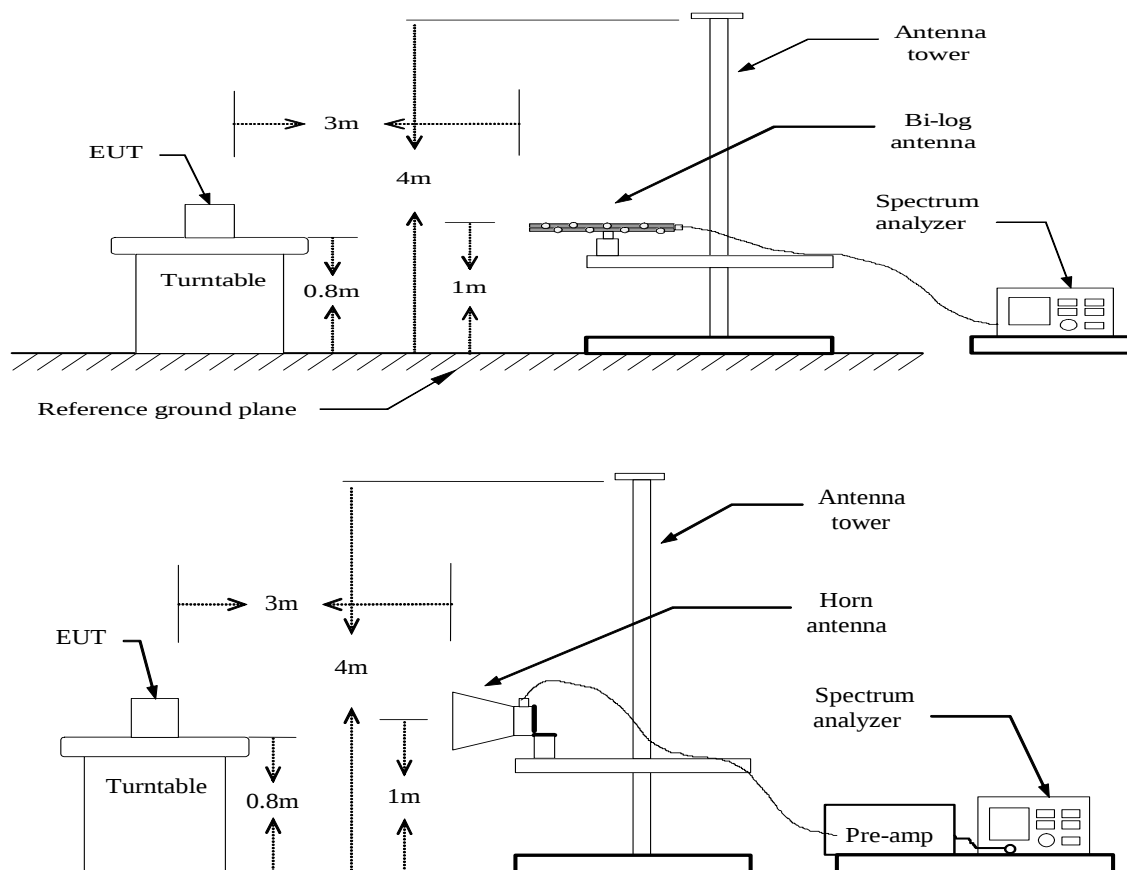
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 m to 4 m) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

### 5.5.4. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor =  $20 \log (\text{specific distance [3m]} / \text{test distance [1.5m]})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

## 5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 5.5.6. Results of Radiated Emissions (9kHz~30MHz)

|               |       |                |         |
|---------------|-------|----------------|---------|
| Temperature   | 25°C  | Humidity       | 60%     |
| Test Engineer | Jacky | Configurations | 802.11a |

| Freq.<br>(MHz) | Level<br>(dBuV) | Over Limit<br>(dB) | Over Limit<br>(dBuV) | Remark   |
|----------------|-----------------|--------------------|----------------------|----------|
| -              | -               | -                  | -                    | See Note |

Note:

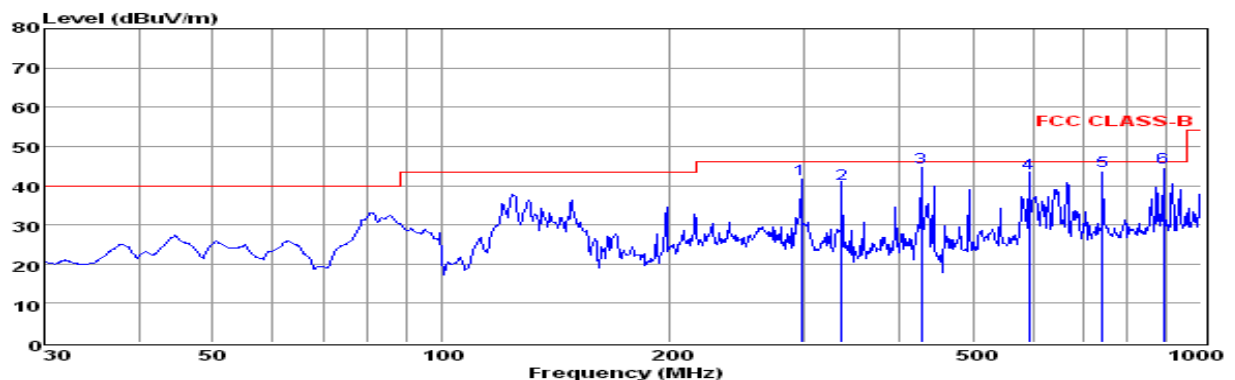
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

## 5.5.7. Results of Radiated Emissions (30MHz~1GHz)

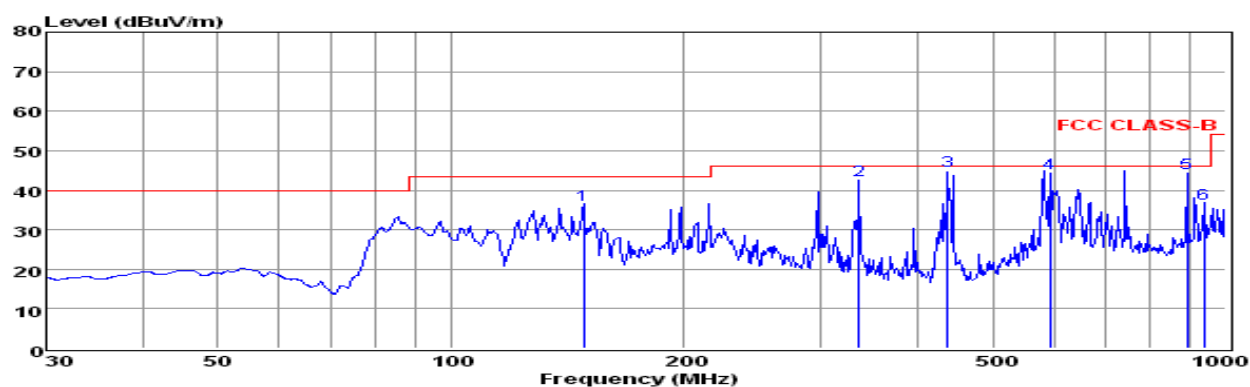
|               |       |                |                  |
|---------------|-------|----------------|------------------|
| Temperature   | 25°C  | Humidity       | 60%              |
| Test Engineer | Jacky | Configurations | 802.11a, 5180MHz |



Env./Ins: 24°C/56%  
 EUT: Module  
 M/N: HT-WiFi B02  
 Power Rating: DC 5V  
 Test Mode: TX-5180MHz  
 Operator: Jacky  
 Memo:  
 pol: VERTICAL

|   | Freq   | Reading | CabLos | Antfac | Measured | Limit  | Over  | Remark |
|---|--------|---------|--------|--------|----------|--------|-------|--------|
|   | MHz    | dBuV    | dB     | dB/m   | dBuV/m   | dBuV/m | dB    |        |
| 1 | 297.22 | 27.48   | 1.12   | 13.01  | 41.61    | 46.00  | -4.39 | QP     |
| 2 | 336.04 | 25.36   | 1.09   | 13.96  | 40.41    | 46.00  | -5.59 | QP     |
| 3 | 428.02 | 27.77   | 1.39   | 15.51  | 44.67    | 46.00  | -1.33 | QP     |
| 4 | 593.05 | 23.15   | 1.51   | 18.32  | 42.98    | 46.00  | -3.02 | QP     |
| 5 | 742.26 | 22.63   | 1.78   | 19.34  | 43.75    | 46.00  | -2.25 | QP     |
| 6 | 890.73 | 21.72   | 1.86   | 20.99  | 44.57    | 46.00  | -1.43 | QP     |

Note: 1. All readings are Quasi-peak values.  
 2. Measured= Reading + Antenna Factor + Cable Loss  
 3. The emission that ate 20db blow the official limit are not reported



Env./Ins: 24°C/56%  
 EUT: Module  
 M/N: HT-WiFi B02  
 Power Rating: DC 5V  
 Test Mode: TX-5180MHz  
 Operator: Jacky  
 Memo:  
 pol: HORIZONTAL

|   | Freq   | Reading | CabLos | Antfac | Measured | Limit  | Over  | Remark |
|---|--------|---------|--------|--------|----------|--------|-------|--------|
|   | MHz    | dBuV    | dB     | dB/m   | dBuV/m   | dBuV/m | dB    |        |
| 1 | 148.44 | 27.08   | 0.86   | 8.25   | 36.19    | 43.50  | -7.31 | QP     |
| 2 | 336.04 | 27.58   | 1.09   | 13.96  | 42.63    | 46.00  | -3.37 | QP     |
| 3 | 437.12 | 27.82   | 1.41   | 15.55  | 44.78    | 46.00  | -1.22 | QP     |
| 4 | 593.05 | 24.62   | 1.51   | 18.32  | 44.45    | 46.00  | -1.55 | QP     |
| 5 | 890.73 | 21.37   | 1.86   | 20.99  | 44.22    | 46.00  | -1.78 | QP     |
| 6 | 938.83 | 13.41   | 1.92   | 21.34  | 36.67    | 46.00  | -9.33 | QP     |

Note: 1. All readings are Quasi-peak values.  
 2. Measured= Reading + Antenna Factor + Cable Loss  
 3. The emission that are 20db below the official limit are not reported

Note:

Pre-scan all modes and recorded the worst case results(802.11a-5180MHz) in this report.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

## 5.5.8. Results for Radiated Emissions (Above 1GHz)

802.11a/Chain 0+Chain 1

Channel 36

| Freq GHz | Read Level dBuV | Ant. Fac dB/m | Pre. Fac dB | Cab.Los dB | Correct level dBuV/m | Limit Line dBuV/m | Over limit dB | Remark  | Pol/Phase  |
|----------|-----------------|---------------|-------------|------------|----------------------|-------------------|---------------|---------|------------|
| 15.54    | 63.14           | 33.06         | 35.04       | 3.94       | 65.1                 | 74                | -8.9          | Peak    | Horizontal |
| 15.54    | 44.71           | 33.06         | 35.04       | 3.94       | 46.67                | 54                | -7.33         | Average | Horizontal |
| 15.54    | 61.58           | 33.06         | 35.04       | 3.94       | 63.54                | 74                | -10.46        | Peak    | Vertical   |
| 15.54    | 43.52           | 33.06         | 35.04       | 3.94       | 45.48                | 54                | -8.52         | Average | Vertical   |

Channel 40

| Freq GHz | Read Level dBuV | Ant. Fac dB/m | Pre. Fac dB | Cab.Los dB | Correct level dBuV/m | Limit Line dBuV/m | Over limit dB | Remark  | Pol/Phase  |
|----------|-----------------|---------------|-------------|------------|----------------------|-------------------|---------------|---------|------------|
| 15.60    | 63.32           | 33.16         | 35.15       | 3.96       | 65.29                | 74                | -8.71         | Peak    | Horizontal |
| 15.06    | 44.58           | 33.16         | 35.15       | 3.96       | 46.55                | 54                | -7.45         | Average | Horizontal |
| 15.60    | 61.12           | 33.16         | 35.15       | 3.96       | 63.09                | 74                | -10.91        | Peak    | Vertical   |
| 15.60    | 43.74           | 33.16         | 35.15       | 3.96       | 45.71                | 54                | -8.29         | Average | Vertical   |

Channel 48

| Freq GHz | Read Level dBuV | Ant. Fac dB/m | Pre. Fac dB | Cab.Los dB | Correct level dBuV/m | Limit Line dBuV/m | Over limit dB | Remark  | Pol/Phase  |
|----------|-----------------|---------------|-------------|------------|----------------------|-------------------|---------------|---------|------------|
| 15.72    | 63.24           | 33.26         | 35.14       | 3.98       | 65.34                | 74                | -8.66         | Peak    | Horizontal |
| 15.72    | 44.63           | 33.26         | 35.14       | 3.98       | 46.73                | 54                | -7.27         | Average | Horizontal |
| 15.72    | 61.81           | 33.26         | 35.14       | 3.98       | 63.91                | 74                | -10.09        | Peak    | Vertical   |
| 15.72    | 43.69           | 33.26         | 35.14       | 3.98       | 45.79                | 54                | -8.21         | Average | Vertical   |

**Notes:**

1. Measuring frequencies from 9k~40GHz, No emission found between lowest internal used/generated frequency to 30MHz.
2. Radiated emissions measured in frequency range from 9k~40GHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

## 5.5.9. Results for Band Edge Emissions

802.11a/Chain 0+Chain 1

Channel 36

| Freq<br>MHz | Read<br>Level<br>dBuV | Ant.<br>Fac<br>dB/m | Pre.<br>Fac<br>dB | Cab.Lo<br>s<br>dB | Correct<br>level<br>dBuV/m | Limit<br>Line<br>dBuV/m | Over<br>limit<br>dB | Remark  | Pol/Phase  |
|-------------|-----------------------|---------------------|-------------------|-------------------|----------------------------|-------------------------|---------------------|---------|------------|
| 5150.00     | 55.15                 | 33.26               | 35.14             | 3.98              | 57.25                      | 74                      | -16.75              | Peak    | Horizontal |
| 5150.00     | 39.75                 | 33.26               | 35.14             | 3.98              | 41.85                      | 54                      | -12.15              | Average | Horizontal |
| 5150.00     | 53.14                 | 33.26               | 35.14             | 3.98              | 55.24                      | 74                      | -18.76              | Peak    | Vertical   |
| 5150.00     | 38.42                 | 33.26               | 35.14             | 3.98              | 40.52                      | 54                      | -13.48              | Average | Vertical   |

## 5.6. Frequency Stability Measurement

### 5.6.1. Standard Applicable

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or  $\pm 20\text{ppm}$  (IEEE 802.11nspecification).

### 5.6.2. Measuring Instruments and Setting

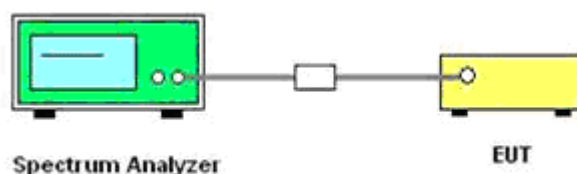
Please refer to section 6 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting                                          |
|--------------------|--------------------------------------------------|
| Detector           | Peak                                             |
| Attenuation        | Auto                                             |
| Span               | Entire absence of modulation emissions bandwidth |
| RBW                | 10KHz                                            |
| RBW                | 10KHz                                            |

### 5.6.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5.  $f_c$  is declaring of channel frequency. Then the frequency error formula is  $(f_c - f)/f_c \times 106 \text{ ppm}$  and the limit is less than  $\pm 20\text{ppm}$  (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is  $-30^\circ\text{C} \sim 50^\circ\text{C}$ .

### 5.6.4. Test Setup Layout



### 5.6.5. EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

## 5.6.6. Test Results of Frequency Stability Measurement

## Voltage vs. Frequency Stability

| Voltage              | Measure Frequency (MHz) |
|----------------------|-------------------------|
| (V)                  | 5200                    |
| 4.5                  | 5199.9960               |
| 5.0                  | 5199.9984               |
| 5.5                  | 5199.9975               |
| Max. Deviation (MHz) | 0.0040                  |
| Max. Deviation (ppm) | 0.77                    |

## Temperature vs. Frequency Stability

| Temperature          | Measure Frequency (MHz) |
|----------------------|-------------------------|
| (°C)                 | 5200                    |
| -30                  | 5199.9954               |
| -20                  | 5199.9962               |
| -10                  | 5199.9978               |
| 0                    | 5199.9952               |
| +10                  | 5199.9968               |
| +20                  | 5199.9949               |
| +30                  | 5199.9969               |
| +40                  | 5199.9953               |
| +50                  | 5199.9974               |
| Max. Deviation (MHz) | 0.0048                  |
| Max. Deviation (ppm) | 0.92                    |

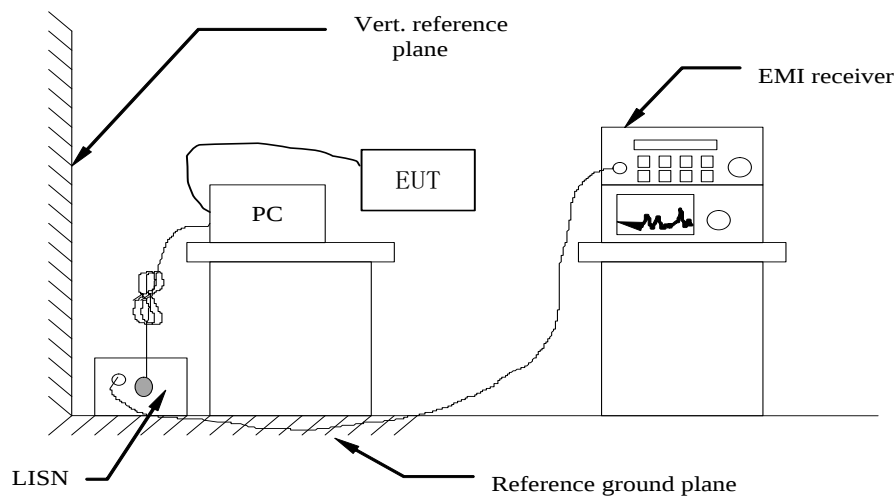
## 5.7. Power line conducted emissions

### 5.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dB $\mu$ V) |          |
|-----------------------|---------------------|----------|
|                       | Quasi-peak          | Average  |
| 0.15 to 0.50          | 66 to 56            | 56 to 46 |
| 0.50 to 5             | 56                  | 46       |
| 5 to 30               | 60                  | 50       |

### 5.7.2 Block Diagram of Test Setup



### 5.7.3 Test Results

PASS.

The test data please refer to following page.

The spectrum plot displays the transmitter output level in dBuV across a frequency range from 0.15 MHz to 30 MHz. Two red lines indicate the FCC Class-B limits: the upper line is for QP (Quasi-Peak) and the lower line is for AV (Average). The blue line represents the actual transmitter output, which shows several peaks labeled 3, 4, 6, 8, 10, and 11. The orange line represents the noise floor, with peaks labeled 2 and 9. The transmitter output is generally below the FCC limits, except for a small peak at 24.5 MHz (labeled 11) which is slightly above the AV limit.

|    | Freq      | Reading | LisnFac | CabLos | Atten_Fac | Measured | Limit | Over   | Remark  |
|----|-----------|---------|---------|--------|-----------|----------|-------|--------|---------|
|    | MHz       | dBuV    | dB      | dB     | dB        | dBuV     | dBuV  | dB     |         |
| 1  | 0.15000   | 31.10   | 9.70    | 0.02   | 10.00     | 50.82    | 66.00 | -15.18 | QP      |
| 2  | 0.15001   | 20.64   | 9.70    | 0.02   | 10.00     | 40.36    | 56.00 | -15.64 | Average |
| 3  | 0.38519   | 9.87    | 9.61    | 0.04   | 10.00     | 29.52    | 58.17 | -28.65 | QP      |
| 4  | 0.38520   | -4.03   | 9.61    | 0.04   | 10.00     | 15.62    | 48.17 | -32.55 | Average |
| 5  | 0.50469   | 3.92    | 9.62    | 0.04   | 10.00     | 23.58    | 46.00 | -22.42 | Average |
| 6  | 0.50469   | 15.64   | 9.62    | 0.04   | 10.00     | 35.30    | 56.00 | -20.70 | QP      |
| 7  | 1.44856   | -6.37   | 9.63    | 0.05   | 10.00     | 13.31    | 46.00 | -32.69 | Average |
| 8  | 1.44855   | 9.46    | 9.63    | 0.05   | 10.00     | 29.14    | 56.00 | -26.86 | QP      |
| 9  | 3.62253   | -7.34   | 9.65    | 0.06   | 10.00     | 12.37    | 46.00 | -33.63 | Average |
| 10 | 3.62252   | 3.49    | 9.65    | 0.06   | 10.00     | 23.20    | 56.00 | -32.80 | QP      |
| 11 | 123.88785 | 4.38    | 9.82    | 0.13   | 10.00     | 24.33    | 50.00 | -25.67 | Average |
| 12 | 123.88784 | 27.51   | 9.82    | 0.13   | 10.00     | 47.46    | 60.00 | -12.54 | QP      |

The spectrum plot shows the transmitter output across a frequency range from 0.15 MHz to 30 MHz. The y-axis represents the signal level in dBuV, ranging from 0 to 80. Two red lines indicate the FCC Class-B limits: the (QP) limit (Quasi-Peak) and the (AV) limit (Average). The blue line represents the measured signal, which shows several peaks, with the most prominent ones at 0.15 MHz, 0.5 MHz, 1 MHz, 7 MHz, and 28 MHz. The orange line represents the noise floor, which is relatively flat across the frequency range.

|    | Freq     | Reading | LisnFac | CabLos | Atten_Fac | Measured | Limit | Over   | Remark  |
|----|----------|---------|---------|--------|-----------|----------|-------|--------|---------|
|    | MHz      | dBuV    | dB      | dB     | dB        | dBuV     | dBuV  | dB     |         |
| 1  | 0.15000  | 31.76   | 9.57    | 0.02   | 10.00     | 51.35    | 66.00 | -14.65 | QP      |
| 2  | 0.15001  | 21.86   | 9.57    | 0.02   | 10.00     | 41.45    | 56.00 | -14.55 | Average |
| 3  | 0.17034  | 26.52   | 9.60    | 0.02   | 10.00     | 46.14    | 64.94 | -18.80 | QP      |
| 4  | 0.17035  | 5.75    | 9.60    | 0.02   | 10.00     | 25.37    | 54.94 | -29.57 | Average |
| 5  | 0.50203  | 15.33   | 9.62    | 0.04   | 10.00     | 34.99    | 56.00 | -21.01 | QP      |
| 6  | 0.50204  | 0.49    | 9.62    | 0.04   | 10.00     | 20.15    | 46.00 | -25.85 | Average |
| 7  | 0.94308  | -4.99   | 9.63    | 0.05   | 10.00     | 14.69    | 46.00 | -31.31 | Average |
| 8  | 0.94308  | 9.63    | 9.63    | 0.05   | 10.00     | 29.31    | 56.00 | -26.69 | QP      |
| 9  | 6.66247  | -8.79   | 9.68    | 0.07   | 10.00     | 10.96    | 50.00 | -39.04 | Average |
| 10 | 6.66237  | 7.62    | 9.68    | 0.07   | 10.00     | 27.37    | 60.00 | -32.63 | QP      |
| 11 | 26.00130 | 6.41    | 9.71    | 0.13   | 10.00     | 26.25    | 50.00 | -23.75 | Average |

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## 5.8. Antenna Requirements

### 5.8.1. Standard Applicable

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### 5.8.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 5.0dBi, and the antenna is connect to PCB board through the ipex connector and no consideration of replacement. Please see EUT photo for details.

### 5.8.3. Results: Compliance.

## 6. LIST OF MEASURING EQUIPMENTS

| Instrument               | Manufacturer   | Model No.                        | Serial No.  | Characteristics | Cal Date         | Due Date         |
|--------------------------|----------------|----------------------------------|-------------|-----------------|------------------|------------------|
| EMC Receiver             | R&S            | ESCS 30                          | 100174      | 9kHz – 2.75GHz  | June 18, 2014    | June 17, 2015    |
| Signal analyzer          | Agilent        | E4448A(External mixers to 40GHz) | US44300469  | 9kHz~40GHz      | July 16, 2014    | July 15, 2015    |
| Signal analyzer          | Agilent        | N9020A                           | MY50510140  | 9kHz~26.5GHz    | October 27, 2014 | October 27, 2015 |
| LISN                     | MESS Tec       | NNB-2/16Z                        | 99079       | 9KHz-30MHz      | June 18, 2014    | June 17, 2015    |
| LISN (Support Unit)      | EMCO           | 3819/2NM                         | 9703-1839   | 9KHz-30MHz      | June 18, 2014    | June 17, 2015    |
| RF Cable-CON             | UTIFLEX        | 3102-26886-4                     | CB049       | 9KHz-30MHz      | June 18, 2014    | June 17, 2015    |
| ISN                      | SCHAFFNER      | ISN ST08                         | 21653       | 9KHz-30MHz      | June 18, 2014    | June 17, 2015    |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M                           | 03CH03-HY   | 30M-1GHz<br>3m  | June 18, 2014    | June 17, 2015    |
| Amplifier                | SCHAFFNER      | COA9231A                         | 18667       | 9kHz-2GHz       | June 18, 2014    | June 17, 2015    |
| Amplifier                | Agilent        | 8449B                            | 3008A02120  | 1GHz-26.5GHz    | July 16, 2014    | July 15, 2015    |
| Amplifier                | MITEQ          | AMF-6F-260400                    | 9121372     | 26.5GHz-40GHz   | July 16, 2014    | July 15, 2015    |
| Spectrum Analyzer        | Agilent        | E4407B                           | MY41440292  | 9k-26.5GHz      | July 16, 2014    | July 15, 2015    |
| Loop Antenna             | R&S            | HFH2-Z2                          | 860004/001  | 9k-30MHz        | June 18, 2014    | June 17, 2015    |
| By-log Antenna           | SCHAFFNER      | CBL 6112D                        | 22237       | 30MHz-1GHz      | June 10, 2014    | June 09, 2015    |
| Horn Antenna             | EMCO           | 3115                             | 6741        | 1GHz-18GHz      | June 10, 2014    | June 09, 2015    |
| Horn Antenna             | SCHWARZBECK    | BBHA9170                         | BBHA9170154 | 15GHz-40GHz     | June 10, 2014    | June 09, 2015    |
| RF Cable-R03m            | Jye Bao        | RG142                            | CB021       | 30MHz-1GHz      | June 18, 2014    | June 17, 2015    |
| RF Cable-HIGH            | SUHNER         | SUCOFLEX 106                     | 03CH03-HY   | 1GHz-40GHz      | June 18, 2014    | June 17, 2015    |
| Spectrum Meter           | R&S            | FSP 30                           | 100023      | 9kHz-30GHz      | July 16, 2014    | July 15, 2015    |
| Power Meter              | R&S            | NRVS                             | 100444      | DC-40GHz        | June 18, 2014    | June 17, 2015    |
| Power Sensor             | R&S            | NRV-Z51                          | 100458      | DC-30GHz        | June 18, 2014    | June 17, 2015    |
| Power Sensor             | R&S            | NRV-Z32                          | 10057       | 30MHz-6GHz      | June 18, 2014    | June 17, 2015    |
| AC Power Source          | HPC            | HPA-500E                         | HPA-9100024 | AC 0~300V       | June 18, 2014    | June 17, 2015    |
| DC power Source          | GW             | GPC-6030D                        | C671845     | DC 1V-60V       | June 18, 2014    | June 17, 2015    |
| Temp. and Humidity       | Giant Force    | GTH-225-20-S                     | MAB0103-00  | N/A             | June 18, 2014    | June 17, 2015    |
| RF CABLE-1m              | JYE Bao        | RG142                            | CB034-1m    | 20MHz-7GHz      | June 18, 2014    | June 17, 2015    |
| RF CABLE-2m              | JYE Bao        | RG142                            | CB)35-2m    | 20MHz-1GHz      | June 18, 2014    | June 17, 2015    |
| Vector signal Generator  | R&S            | SMU200A                          | 102098      | 100kHz~6GHz     | June 18, 2014    | June 17, 2015    |
| Signal Generator         | R&S            | SMR40                            | 10016       | 10MHz~40GHz     | July 16, 2014    | July 15, 2015    |
| Oscilloscope             | Tektonix       | TDS380                           | B016197     | 400MHz/2GRS     | July 16, 2014    | July 15, 2015    |

7. MANUFACTURER/ APPROVAL HOLDER DECLARATION

The following series model(s):

|    |    |    |    |
|----|----|----|----|
| -- | -- | -- | -- |
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Belong to the tested device:

Product description : Module

Model name : HT-WiFi B02

Remark: No additional models were tested.

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