



# SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.  
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

## FCC RADIO TEST REPORT

|                     |                                                                        |
|---------------------|------------------------------------------------------------------------|
| Applicant's company | D-Link Corporation                                                     |
| Applicant Address   | No.289, Sinhu 3rd Rd., Neihs District, Taipei City 114, Taiwan, R.O.C. |
| FCC ID              | KA2AP2660A1                                                            |

|                   |                                                       |
|-------------------|-------------------------------------------------------|
| Product Name      | Wireless AC1200 Concurrent Dual Band PoE Access Point |
| Brand Name        | D-Link                                                |
| Model No.         | DAP-2660                                              |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart E § 15.407                 |
| Test Freq. Range  | 5150 ~ 5250 MHz / 5725 ~ 5850 MHz                     |
| Received Date     | Mar. 03, 2014                                         |
| Final Test Date   | Sep. 18, 2014                                         |
| Submission Type   | Class II Change                                       |

### Statement

**Test result included is for the IEEE 802.11n and IEEE 802.11a/ac of the product.**

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009, 47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01r02, KDB662911 D01 v02r01, KDB644545 D03 v01, ET Docket No. 13-49; FCC 16-24.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



## Table of Contents

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| <b>1. VERIFICATION OF COMPLIANCE .....</b>                      | <b>1</b>       |
| <b>2. SUMMARY OF THE TEST RESULT .....</b>                      | <b>2</b>       |
| <b>3. GENERAL INFORMATION .....</b>                             | <b>3</b>       |
| 3.1. Product Details.....                                       | 3              |
| 3.2. Accessories.....                                           | 4              |
| 3.3. Table for Filed Antenna.....                               | 5              |
| 3.4. Table for Carrier Frequencies .....                        | 6              |
| 3.5. Table for Test Modes .....                                 | 7              |
| 3.6. Table for Testing Locations.....                           | 8              |
| 3.7. Table for Class II Change .....                            | 9              |
| 3.8. Table for Supporting Units .....                           | 9              |
| 3.9. Table for Parameters of Test Software Setting .....        | 10             |
| 3.10. EUT Operation during Test .....                           | 10             |
| 3.11. Duty Cycle .....                                          | 10             |
| 3.12. Test Configurations .....                                 | 11             |
| <b>4. TEST RESULT .....</b>                                     | <b>12</b>      |
| 4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement..... | 12             |
| 4.2. Maximum Conducted Output Power Measurement.....            | 19             |
| 4.3. Power Spectral Density Measurement .....                   | 22             |
| 4.4. Radiated Emissions Measurement .....                       | 27             |
| 4.5. Band Edge Emissions Measurement .....                      | 39             |
| 4.6. Frequency Stability Measurement .....                      | 44             |
| 4.7. Antenna Requirements .....                                 | 46             |
| <b>5. LIST OF MEASURING EQUIPMENTS .....</b>                    | <b>47</b>      |
| <b>6. MEASUREMENT UNCERTAINTY.....</b>                          | <b>48</b>      |
| <b>APPENDIX A. TEST PHOTOS .....</b>                            | <b>A1 ~ A2</b> |

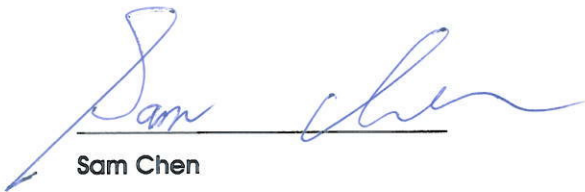
## History of This Test Report

| REPORT NO.  | VERSION | DESCRIPTION             | ISSUED DATE   |
|-------------|---------|-------------------------|---------------|
| FR432156-13 | Rev. 01 | Initial issue of report | Jun. 01, 2016 |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |
|             |         |                         |               |

## 1. VERIFICATION OF COMPLIANCE

Product Name : Wireless AC1200 Concurrent Dual Band PoE Access Point  
Brand Name : D-Link  
Model No. : DAP-2660  
Applicant : D-Link Corporation  
Test Rule Part(s) : 47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Mar. 03, 2014 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



Sam Chen

SPORTON INTERNATIONAL INC.

## 2. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart E |              |                                                    |          |
|------------------------------------------------|--------------|----------------------------------------------------|----------|
| Part                                           | Rule Section | Description of Test                                | Result   |
| 4.1                                            | 15.407(a)    | 26dB Spectrum Bandwidth and 99% Occupied Bandwidth | Complies |
| 4.2                                            | 15.407(a)    | Maximum Conducted Output Power                     | Complies |
| 4.3                                            | 15.407(a)    | Power Spectral Density                             | Complies |
| 4.4                                            | 15.407(b)    | Radiated Emissions                                 | Complies |
| 4.5                                            | 15.407(b)    | Band Edge Emissions                                | Complies |
| 4.6                                            | 15.407(g)    | Frequency Stability                                | Complies |
| 4.7                                            | 15.203       | Antenna Requirements                               | Complies |

### 3. GENERAL INFORMATION

#### 3.1. Product Details

| Items                          | Description                                                                                                                                                       |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Type                   | WLAN (2TX, 2RX)                                                                                                                                                   |
| Radio Type                     | Intentional Transceiver                                                                                                                                           |
| Power Type                     | From power adapter or PoE                                                                                                                                         |
| Modulation                     | IEEE 802.11a: OFDM<br>IEEE 802.11n/ac: see the below table                                                                                                        |
| Data Modulation                | IEEE 802.11a/n: OFDM (BPSK / QPSK / 16QAM / 64QAM)<br>IEEE 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)                                                  |
| Data Rate (Mbps)               | IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54)<br>IEEE 802.11n/ac: see the below table                                                                                |
| Frequency Range                | 5150 ~ 5250 MHz / 5725 ~ 5850 MHz                                                                                                                                 |
| Channel Number                 | 9 for 20MHz bandwidth ; 4 for 40MHz bandwidth<br>2 for 80MHz bandwidth                                                                                            |
| Channel Band Width (99%)       | IEEE 802.11a: 17.69 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 18.33 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 36.15 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 75.38 MHz |
| Maximum Conducted Output Power | IEEE 802.11a: 27.54 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 27.58 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 26.57 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 20.19 dBm |
| Carrier Frequencies            | Please refer to section 3.4                                                                                                                                       |
| Antenna                        | Please refer to section 3.3                                                                                                                                       |

| Items                | Description                                                                                       |
|----------------------|---------------------------------------------------------------------------------------------------|
| Communication Mode   | <input checked="" type="checkbox"/> IP Based (Load Based) <input type="checkbox"/> Frame Based    |
| Beamforming Function | <input type="checkbox"/> With beamforming <input checked="" type="checkbox"/> Without beamforming |
| Operate Condition    | <input checked="" type="checkbox"/> Indoor <input type="checkbox"/> Outdoor                       |

#### Antenna and Band width

| Antenna         | Two (TX) |        |        |
|-----------------|----------|--------|--------|
| Band width Mode | 20 MHz   | 40 MHz | 80 MHz |
| IEEE 802.11a    | V        | X      | X      |
| IEEE 802.11n    | V        | V      | X      |
| IEEE 802.11ac   | V        | V      | V      |

### IEEE 11n/ac Spec.

| Protocol                                                                                                                                                                                                                                                                                                                                                                                                                       | Number of Transmit Chains (NTX) | Data Rate / MCS |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|
| 802.11n (HT20)                                                                                                                                                                                                                                                                                                                                                                                                                 | 2                               | MCS 0-15        |
| 802.11n (HT40)                                                                                                                                                                                                                                                                                                                                                                                                                 | 2                               | MCS 0-15        |
| 802.11ac (VHT20)                                                                                                                                                                                                                                                                                                                                                                                                               | 2                               | MCS 0-9/Nss1-2  |
| 802.11ac (VHT40)                                                                                                                                                                                                                                                                                                                                                                                                               | 2                               | MCS 0-9/Nss1-2  |
| 802.11ac (VHT80)                                                                                                                                                                                                                                                                                                                                                                                                               | 2                               | MCS 0-9/Nss1-2  |
| <p>Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput).<br/>Then EUT supports HT20 and HT40.</p> <p>Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT supports VHT20, VHT40 and VHT80.</p> <p>Note 3: Modulation modes consist of below configuration:<br/>HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac</p> |                                 |                 |

### 3.2. Accessories

| Power               | Brand  | Model           | Rating                                                  |
|---------------------|--------|-----------------|---------------------------------------------------------|
| Adapter 1           | D-Link | AMS9-1201000FU2 | Input:100-240V~50/60Hz, 0.5A/27VA<br>Output:12 V, 1.0 A |
| Adapter 2           | D-Link | F12W3-120100SPA | Input:100-240V~50/60Hz, 0.3A<br>Output:12V, 1A          |
| Others              |        |                 |                                                         |
| Wall-mounted rack*1 |        |                 |                                                         |

### 3.3. Table for Filed Antenna

| Ant. | Brand   | P/N       | Antenna Type | Connector | Gain (dBi) |        | Cable loss (dBi) |        | True Gain (dBi) |        |
|------|---------|-----------|--------------|-----------|------------|--------|------------------|--------|-----------------|--------|
|      |         |           |              |           | 2.4GHz     | 5GHz   | 2.4GHz           | 5GHz   | 2.4GHz          | 5GHz   |
| 1    | HONGLIN | 290-20113 | PIFA Antenna | I-PEX     | 2.67       | -      | 0.47             | -      | 2.2             | -      |
| 2    | HONGLIN | 290-20113 | PIFA Antenna | Murata    | 3.88       | -      | -                | -      | 3.88            | -      |
| 3    | HONGLIN | 290-20114 | PIFA Antenna | Murata    | -          | Note 2 | -                | -      | -               | Note 2 |
| 4    | HONGLIN | 290-20114 | PIFA Antenna | I-PEX     | -          | Note 2 | -                | Note 2 | -               | Note 2 |

Note 1: The EUT has four antennas.

**For <2.4GHz>**

For IEEE 802.11b/g/n mode (2TX/2RX)

Ant. 1 and Ant. 2 could transmit/receive simultaneously.

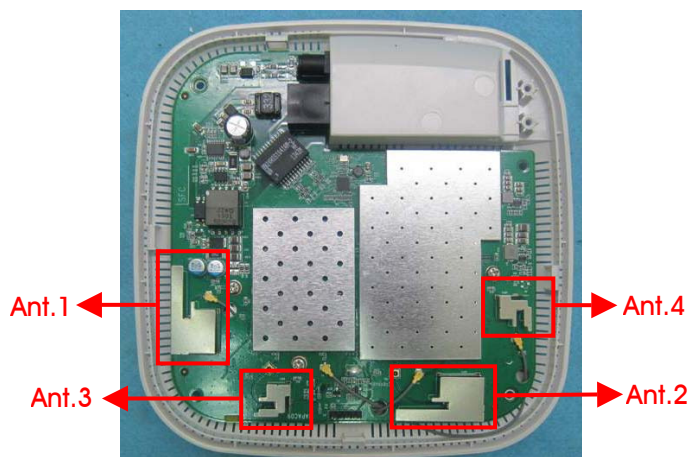
**For <5GHz>**

For IEEE 802.11a/n/ac mode (2TX, 2RX)

Ant. 3 and Ant. 4 could transmit/receive simultaneously.

Note 2:

| Ant.3           |            | Ant.4           |            |                  |                 |
|-----------------|------------|-----------------|------------|------------------|-----------------|
| Frequency (MHz) | Gain (dBi) | Frequency (MHz) | Gain (dBi) | Cable loss (dBi) | True Gain (dBi) |
| 5180            | 3.66       | 5180            | 3.51       | 0.46             | 3.05            |
| 5190            | 3.66       | 5190            | 3.51       | 0.46             | 3.05            |
| 5200            | 3.66       | 5200            | 3.51       | 0.46             | 3.05            |
| 5210            | 3.66       | 5210            | 3.51       | 0.46             | 3.05            |
| 5230            | 3.66       | 5230            | 3.51       | 0.46             | 3.05            |
| 5240            | 3.66       | 5240            | 3.51       | 0.46             | 3.05            |
| 5745            | 4.03       | 5745            | 5.1        | 0.46             | 4.64            |
| 5755            | 4.03       | 5755            | 5.1        | 0.46             | 4.64            |
| 5775            | 4.03       | 5775            | 5.1        | 0.46             | 4.64            |
| 5785            | 4.03       | 5785            | 5.1        | 0.46             | 4.64            |
| 5795            | 4.02       | 5795            | 4.9        | 0.46             | 4.44            |
| 5825            | 4.02       | 5825            | 4.9        | 0.46             | 4.44            |





### 3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 38, 46, 151, 159.

For 80MHz bandwidth systems, use Channel 42, 155.

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5150~5250 MHz<br>Band 1 | 36          | 5180 MHz  | 44          | 5220 MHz  |
|                         | 38          | 5190 MHz  | 46          | 5230 MHz  |
|                         | 40          | 5200 MHz  | 48          | 5240 MHz  |
|                         | 42          | 5210 MHz  | -           | -         |
| 5725~5850 MHz<br>Band 4 | 149         | 5745 MHz  | 157         | 5785 MHz  |
|                         | 151         | 5755 MHz  | 159         | 5795 MHz  |
|                         | 153         | 5765 MHz  | 161         | 5805 MHz  |
|                         | 155         | 5775 MHz  | 165         | 5825 MHz  |

### 3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items                                                   | Mode          |        | Data Rate | Channel  | Ant. |
|--------------------------------------------------------------|---------------|--------|-----------|----------|------|
| Max. Conducted Output Power                                  | 11a/BPSK      | Band 1 | 6Mbps     | 36/40/48 | 3+4  |
|                                                              | 11ac VHT20    | Band 1 | MCS0/Nss1 | 36/40/48 | 3+4  |
|                                                              | 11ac VHT40    | Band 1 | MCS0/Nss1 | 38/46    | 3+4  |
|                                                              | 11ac VHT80    | Band 1 | MCS0/Nss1 | 42       | 3+4  |
| Power Spectral Density                                       | 11a/BPSK      | Band 1 | 6Mbps     | 36/40/48 | 3+4  |
|                                                              | 11ac VHT20    | Band 1 | MCS0/Nss1 | 36/40/48 | 3+4  |
|                                                              | 11ac VHT40    | Band 1 | MCS0/Nss1 | 38/46    | 3+4  |
|                                                              | 11ac VHT80    | Band 1 | MCS0/Nss1 | 42       | 3+4  |
| 26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement | 11a/BPSK      | Band 1 | 6Mbps     | 36/40/48 | 3+4  |
|                                                              | 11ac VHT20    | Band 1 | MCS0/Nss1 | 36/40/48 | 3+4  |
|                                                              | 11ac VHT40    | Band 1 | MCS0/Nss1 | 38/46    | 3+4  |
|                                                              | 11ac VHT80    | Band 1 | MCS0/Nss1 | 42       | 3+4  |
| Radiated Emission Above 1GHz                                 | 11a/BPSK      | Band 1 | 6Mbps     | 36/40/48 | 3+4  |
|                                                              | 11ac VHT20    | Band 1 | MCS0/Nss1 | 36/40/48 | 3+4  |
|                                                              | 11ac VHT40    | Band 1 | MCS0/Nss1 | 38/46    | 3+4  |
|                                                              | 11ac VHT80    | Band 1 | MCS0/Nss1 | 42       | 3+4  |
| Band Edge Emission                                           | 11a/BPSK      | Band 1 | 6Mbps     | 36/40/48 | 3+4  |
|                                                              | 11ac VHT20    | Band 1 | MCS0/Nss1 | 36/40/48 | 3+4  |
|                                                              | 11ac VHT40    | Band 1 | MCS0/Nss1 | 38/46    | 3+4  |
|                                                              | 11ac VHT80    | Band 1 | MCS0/Nss1 | 42       | 3+4  |
| Frequency Stability                                          | Un-modulation |        | -         | 40       | 3+4  |

Note1: VHT20/VHT40 covers HT20/HT40, due to same modulation.

Note2: The PoE information as below, and the PoE is for testing purposes only, will not be marketed.

| Support Unit | Brand | Model        | FCC ID |
|--------------|-------|--------------|--------|
| PoE          | LB    | SA06-20S48-V | N/A    |

The following test modes were performed for all tests:

#### For Radiated Emission test:

There are two modes of EUT, one is Stand of EUT, and the other is Laying of EUT.

After evaluating, Stand of EUT has been evaluated to be the worst case.

Consequently, measurement for Radiated Emission above 1GHz test will follow this same test mode.

Mode 1. CTX

#### For Co-location MPE Test:

The EUT could be applied with 2.4GHz WLAN function and 5GHz WLAN function; therefore Co-location Maximum Permissible Exposure (Please refer to Sporton test report: FA432156-13) test is added for simultaneously transmit

between 2.4GHz WLAN function and 5GHz WLAN function.

### 3.6. Table for Testing Locations

| Test Site Location |                                                                            |          |                     |             |              |
|--------------------|----------------------------------------------------------------------------|----------|---------------------|-------------|--------------|
| Address:           | No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C. |          |                     |             |              |
| TEL:               | 886-3-656-9065                                                             |          |                     |             |              |
| FAX:               | 886-3-656-9085                                                             |          |                     |             |              |
| Test Site No.      | Site Category                                                              | Location | FCC Designation No. | IC File No. | VCCI Reg. No |
| 03CH01-CB          | SAC                                                                        | Hsin Chu | TW0006              | IC 4086D    | -            |
| TH01-CB            | OVEN Room                                                                  | Hsin Chu | -                   | -           | -            |

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

### 3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR432156AA and FR432156AB.

Below is the table for the change of the product with respect to the original one.

| Modifications                                                                                                            | Performance Checking                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Updating 5GHz Band 1 to "New Rules" from "Old Rules".                                                                    | 1. 26dB Bandwidth and 99% Occupied Bandwidth<br>2. Maximum Conducted Output Power<br>3. Power Spectral Density<br>4. Radiated Emissions above 1GHz<br>5. Band Edge Emissions<br>6. Frequency Stability<br>7. Maximum Permissible Exposure |
| Updating test rule of 5GHz band 4 to "15.407 (b)(4)(ii) of New Rules (ET Docket No. 13-49; FCC 16-24)" from "Old Rules". | After evaluating, it's not necessary to re-test all test items for 5GHz Band 4 updating to "New Rules" due to the same power as original filing.                                                                                          |

### 3.8. Table for Supporting Units

For Test Site No: 03CH01-CB

| Support Unit | Brand | Model | FCC ID |
|--------------|-------|-------|--------|
| Notebook     | DELL  | M1330 | DoC    |

For Test Site No: TH01-CB

| Support Unit | Brand | Model | FCC ID |
|--------------|-------|-------|--------|
| Notebook     | DELL  | E6430 | DoC    |

### 3.9. Table for Parameters of Test Software Setting

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

| Test Software Version    | DOS                  |          |          |
|--------------------------|----------------------|----------|----------|
| Mode                     | Test Frequency (MHz) |          |          |
|                          | NCB: 20MHz           |          |          |
|                          | 5180 MHz             | 5200 MHz | 5240 MHz |
| 802.11a                  | 20.5                 | 24       | 24       |
| 802.11ac MCS0/Nss1 VHT20 | 20.5                 | 24       | 24       |
| Mode                     | NCB: 40MHz           |          |          |
| 802.11ac MCS0/Nss1 VHT40 | 5190 MHz             | 5230 MHz |          |
|                          | 18.5                 | 24       |          |
| Mode                     | NCB: 80MHz           |          |          |
| 802.11ac MCS0/Nss1 VHT80 | 5210 MHz             |          |          |
|                          | 18                   |          |          |

### 3.10. EUT Operation during Test

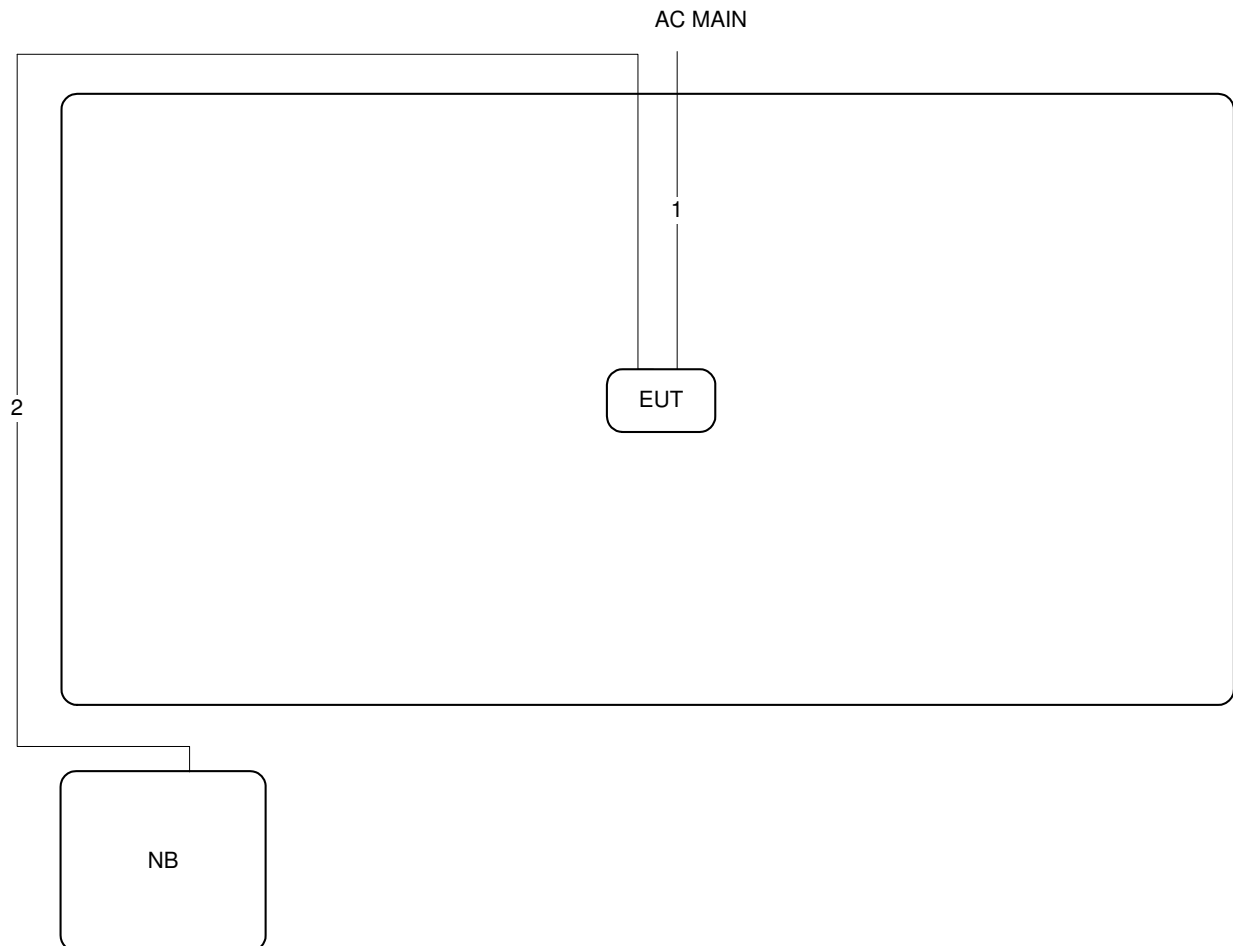
The EUT was programmed to be in continuously transmitting mode.

### 3.11. Duty Cycle

| Mode                     | On Time<br>(ms) | On+Off Time<br>(ms) | Duty Cycle<br>(%) | Duty Factor<br>(dB) | 1/T Minimum VBW<br>(kHz) |
|--------------------------|-----------------|---------------------|-------------------|---------------------|--------------------------|
| 802.11a                  | 2.030           | 2.080               | 97.60%            | 0.11                | 0.49                     |
| 802.11ac MCS0/Nss1 VHT20 | 1.900           | 1.950               | 97.44%            | 0.11                | 0.53                     |
| 802.11ac MCS0/Nss1 VHT40 | 0.920           | 0.960               | 95.83%            | 0.18                | 1.09                     |
| 802.11ac MCS0/Nss1 VHT80 | 0.440           | 0.490               | 89.80%            | 0.47                | 2.27                     |

## 3.12. Test Configurations

### 3.12.1. Radiation Emissions Test Configuration



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 1.2m   |
| 2    | RJ-45 cable | No       | 10m    |

## 4. TEST RESULT

### 4.1. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

#### 4.1.1. Limit

No restriction limits.

#### 4.1.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| 26dB Bandwidth         |                                            |
|------------------------|--------------------------------------------|
| Spectrum Parameters    | Setting                                    |
| Attenuation            | Auto                                       |
| Span Frequency         | > 26dB Bandwidth                           |
| RBW                    | Approximately 1% of the emission bandwidth |
| VBW                    | VBW > RBW                                  |
| Detector               | Peak                                       |
| Trace                  | Max Hold                                   |
| Sweep Time             | Auto                                       |
| 99% Occupied Bandwidth |                                            |
| Spectrum Parameters    | Setting                                    |
| Span                   | 1.5 times to 5.0 times the OBW             |
| RBW                    | 1 % to 5 % of the OBW                      |
| VBW                    | $\geq 3 \times \text{RBW}$                 |
| Detector               | Peak                                       |
| Trace                  | Max Hold                                   |

#### 4.1.3. Test Procedures

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.  
Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

#### 4.1.4. Test Setup Layout

For Radiated 26dB Bandwidth and 99% Occupied Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.4.4.

#### 4.1.5. Test Deviation

There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

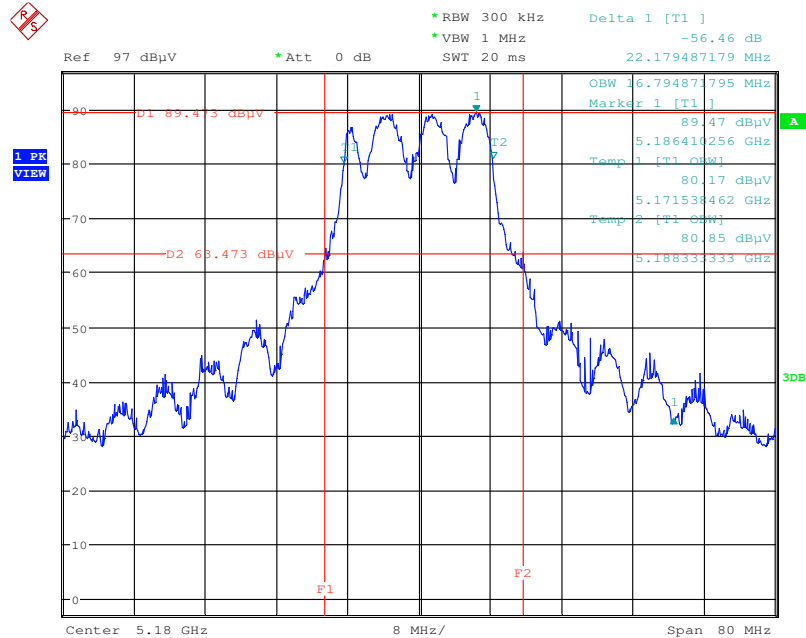
#### 4.1.7. Test Result of 26dB Bandwidth and 99% Occupied Bandwidth

|               |           |          |     |
|---------------|-----------|----------|-----|
| Temperature   | 20°C      | Humidity | 52% |
| Test Engineer | Jim Huang |          |     |

| Mode                        | Frequency | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|-----------------------------|-----------|----------------------|------------------------------|
| 802.11a                     | 5180 MHz  | 22.17                | 16.79                        |
|                             | 5200 MHz  | 31.41                | 17.69                        |
|                             | 5240 MHz  | 27.05                | 17.30                        |
| 802.11ac<br>MCS0/Nss1 VHT20 | 5180 MHz  | 21.66                | 18.07                        |
|                             | 5200 MHz  | 27.82                | 18.33                        |
|                             | 5240 MHz  | 26.92                | 18.33                        |
| 802.11ac<br>MCS0/Nss1 VHT40 | 5190 MHz  | 41.28                | 36.15                        |
|                             | 5230 MHz  | 47.69                | 36.15                        |
| 802.11ac<br>MCS0/Nss1 VHT80 | 5210 MHz  | 82.56                | 75.38                        |

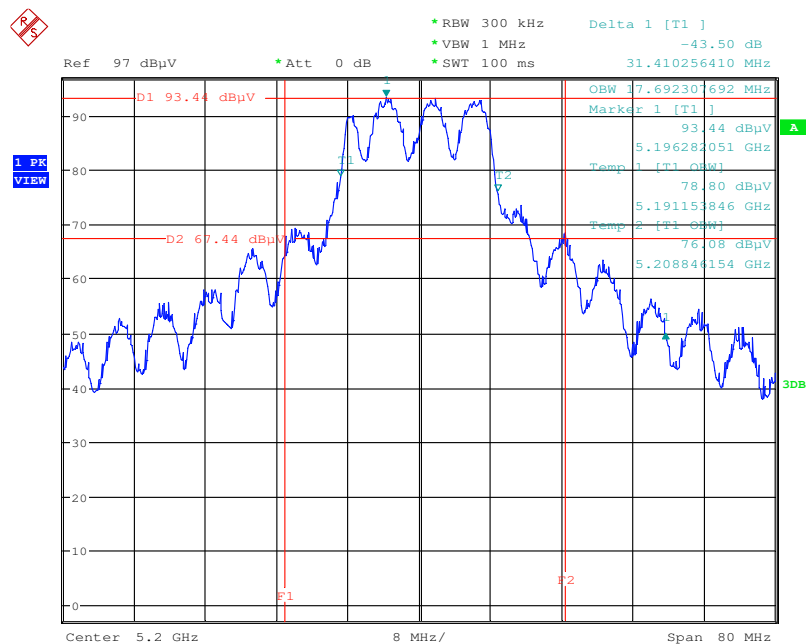


## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5180 MHz



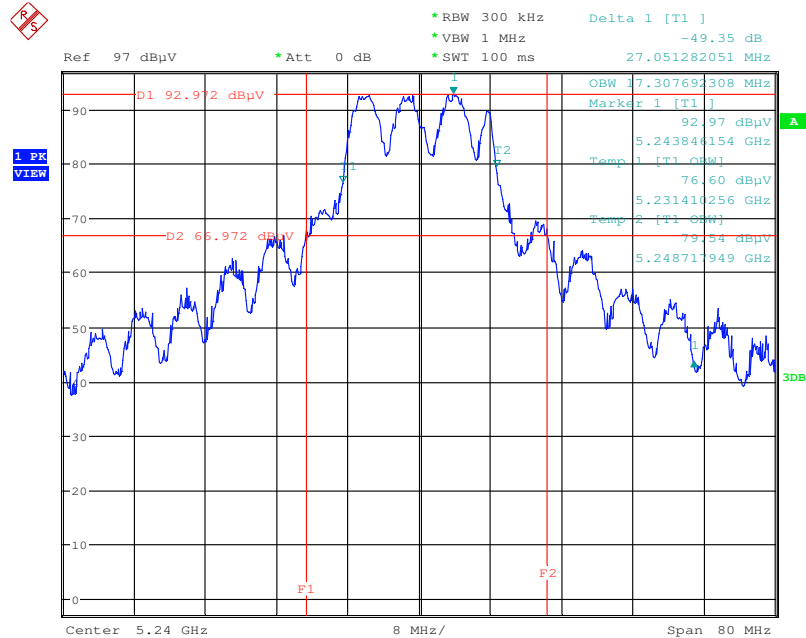
Date: 18.SEP.2014 18:12:30

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5200 MHz



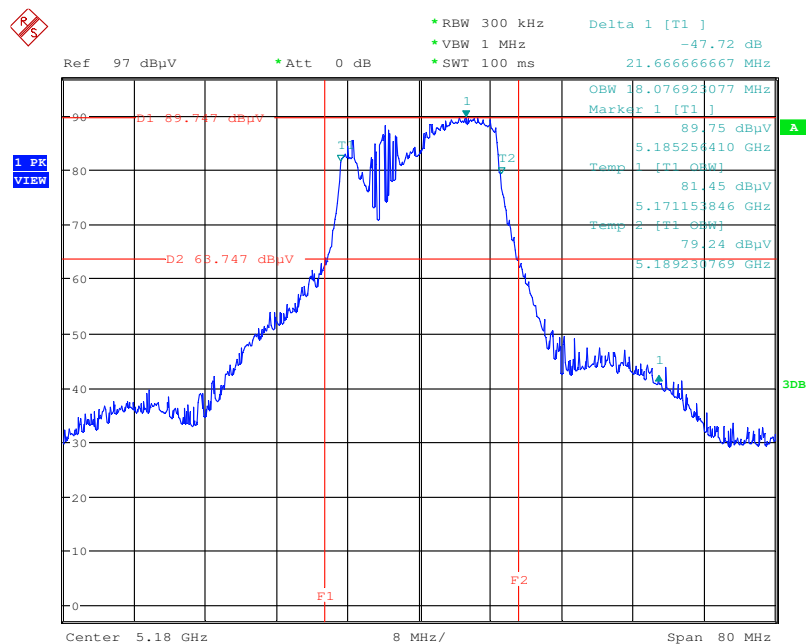
Date: 18.SEP.2014 18:13:19

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5240 MHz



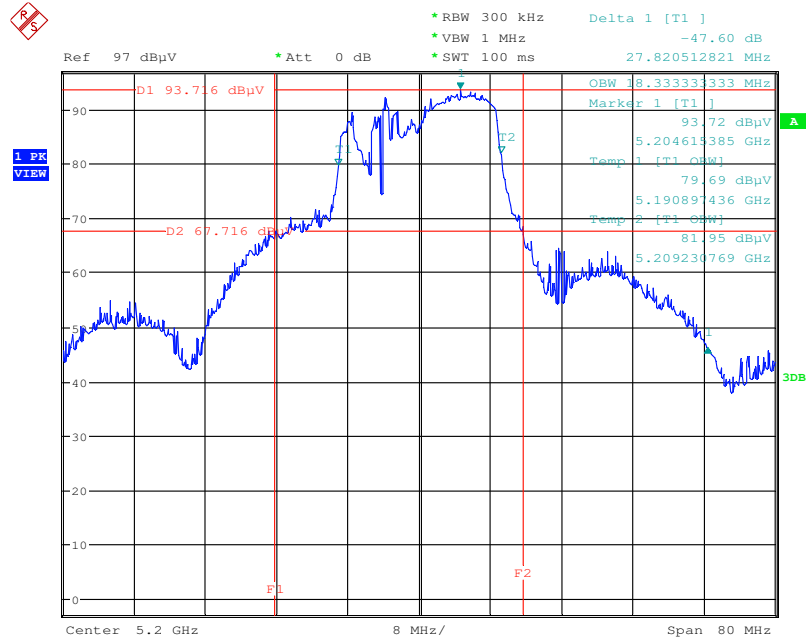
Date: 18.SEP.2014 18:13:46

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5180 MHz



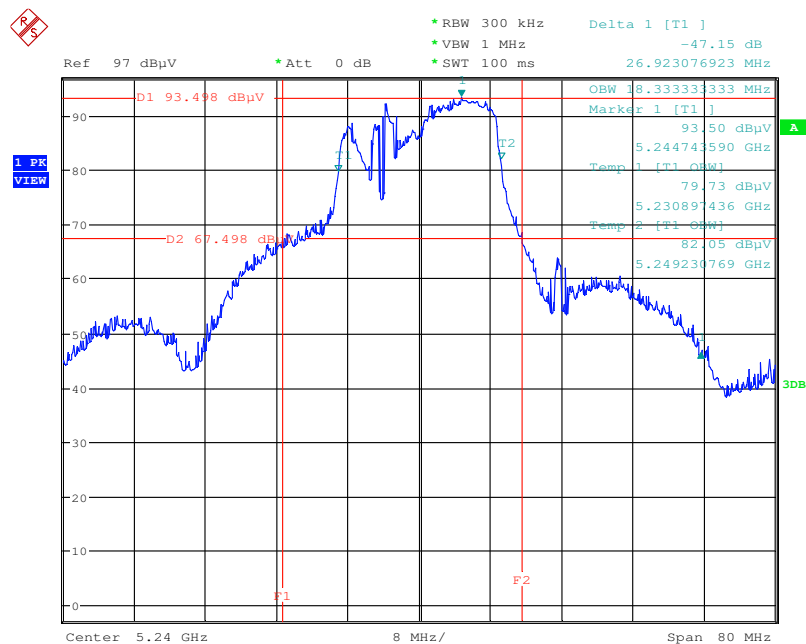
Date: 18.SEP.2014 18:18:57

# 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5200 MHz



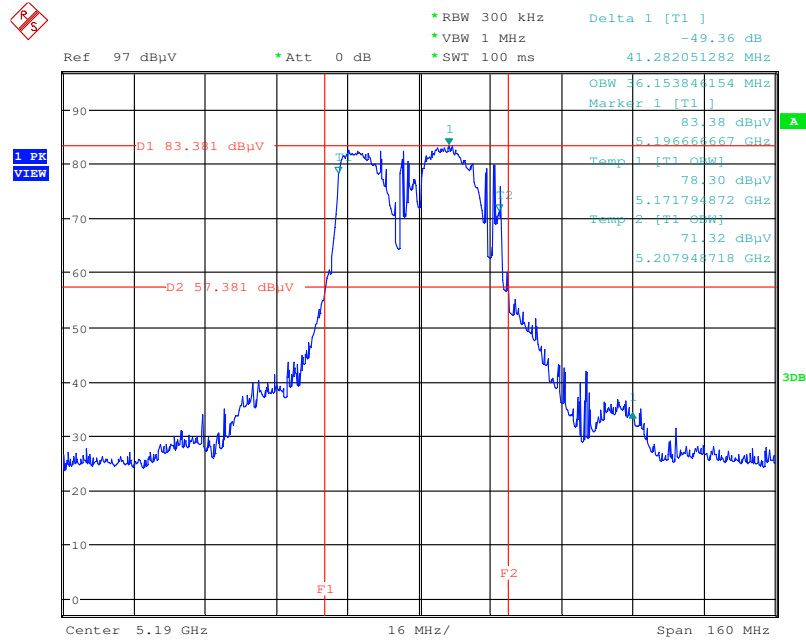
Date: 18.SEP.2014 18:19:30

# 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5240 MHz



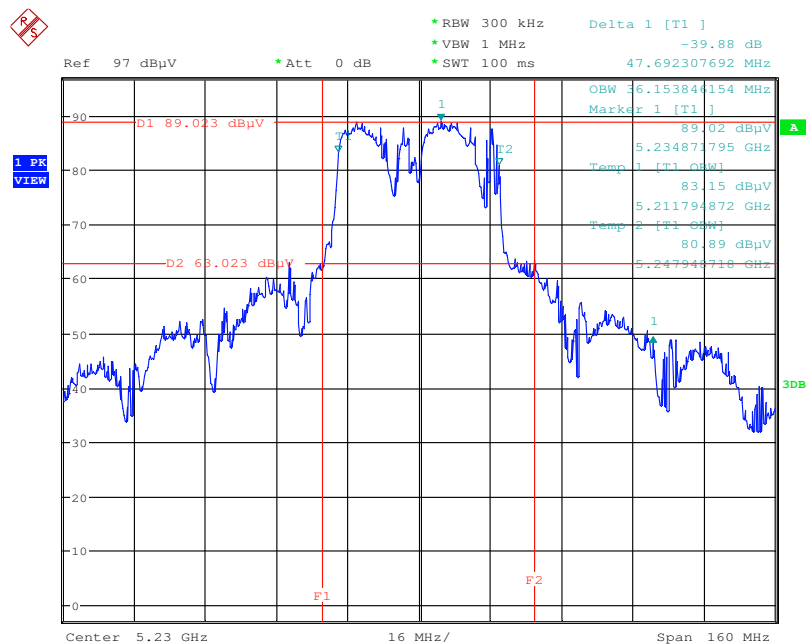
Date: 18.SEP.2014 18:19:59

# 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5190 MHz



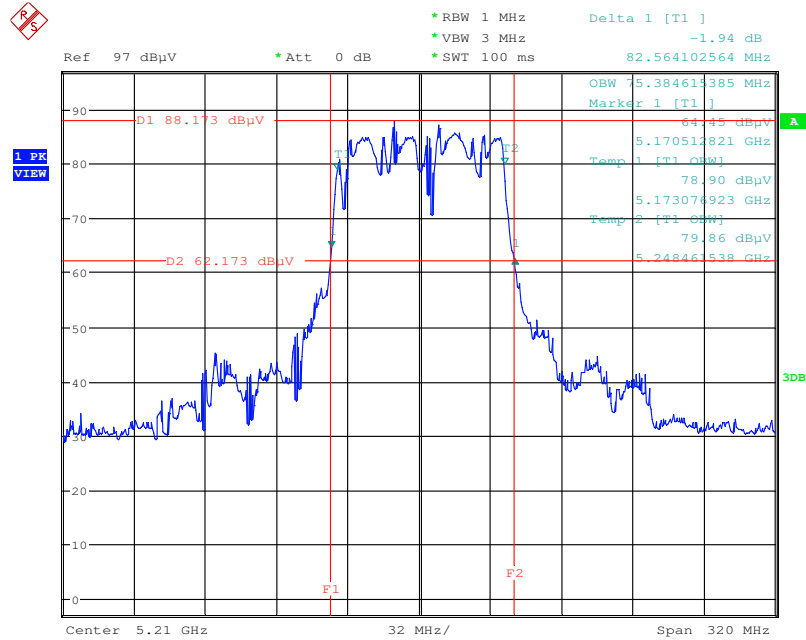
Date: 18.SEP.2014 19:36:36

# 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5230 MHz



Date: 18.SEP.2014 19:37:33

## 26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4 / 5210 MHz



Date: 18.SEP.2014 19:43:03

## 4.2. Maximum Conducted Output Power Measurement

### 4.2.1. Limit

| Frequency Band                      |                                                             | Limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> | 5.15~5.25 GHz                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                     | Operating Mode                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                     | <input type="checkbox"/> Outdoor access point               | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. 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. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).                      |
|                                     | <input checked="" type="checkbox"/> Indoor access point     | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm) provided the maximum antenna gain does not exceed 6 dBi. 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.                                                                                                                                                 |
|                                     | <input type="checkbox"/> Fixed point-to-point access points | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. |
|                                     | <input type="checkbox"/> Client devices                     | The maximum conducted output power over the frequency band of operation shall not exceed 250 mW (24dBm) provided the maximum antenna gain does not exceed 6 dBi. 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.                                                                                                                                              |

|                          |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> | 5.725~5.85 GHz | The maximum conducted output power over the frequency band of operation shall not exceed 1 W (30dBm). 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. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. |
|--------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 4.2.2. Measuring Instruments and Setting

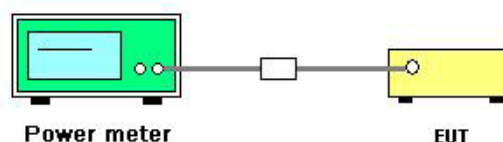
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

| Power Meter Parameter | Setting |
|-----------------------|---------|
| Detector              | AVERAGE |

#### 4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01r02 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (E) Maximum conducted output power =>3. Measurement using a Power Meter (PM) =>b) Method PM-G (Measurement using a gated RF average power meter).
3. Multiple antenna systems was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

#### 4.2.4. Test Setup Layout



#### 4.2.5. Test Deviation

There is no deviation with the original standard.

#### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.2.7. Test Result of Maximum Conducted Output Power

|               |           |           |               |
|---------------|-----------|-----------|---------------|
| Temperature   | 20°C      | Humidity  | 52%           |
| Test Engineer | Jim Huang | Test Date | Sep. 18, 2014 |

| Mode                           | Frequency | Conducted Power (dBm) |        |       | Max. Limit (dBm) | Result   |
|--------------------------------|-----------|-----------------------|--------|-------|------------------|----------|
|                                |           | Ant. 3                | Ant. 4 | Total |                  |          |
| 802.11a                        | 5180 MHz  | 21.53                 | 21.03  | 24.30 | 30.00            | Complies |
|                                | 5200 MHz  | 24.81                 | 24.24  | 27.54 | 30.00            | Complies |
|                                | 5240 MHz  | 24.86                 | 24.05  | 27.48 | 30.00            | Complies |
| 802.11ac<br>MCS0/Nss1<br>VHT20 | 5180 MHz  | 21.61                 | 20.87  | 24.27 | 30.00            | Complies |
|                                | 5200 MHz  | 24.95                 | 24.15  | 27.58 | 30.00            | Complies |
|                                | 5240 MHz  | 24.81                 | 23.97  | 27.42 | 30.00            | Complies |
| 802.11ac<br>MCS0/Nss1<br>VHT40 | 5190 MHz  | 18.44                 | 18.02  | 21.25 | 30.00            | Complies |
|                                | 5230 MHz  | 23.78                 | 23.33  | 26.57 | 30.00            | Complies |
| 802.11ac<br>MCS0/Nss1<br>VHT80 | 5210 MHz  | 16.56                 | 17.72  | 20.19 | 30.00            | Complies |



### 4.3. Power Spectral Density Measurement

#### 4.3.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.2.1.

| Frequency Band                      |                                    | Limit         |
|-------------------------------------|------------------------------------|---------------|
| <input checked="" type="checkbox"/> | 5.15~5.25 GHz                      |               |
|                                     | Operating Mode                     |               |
| <input type="checkbox"/>            | Outdoor access point               | 17 dBm/MHz    |
| <input checked="" type="checkbox"/> | Indoor access point                | 17 dBm/MHz    |
| <input type="checkbox"/>            | Fixed point-to-point access points | 17 dBm/MHz    |
| <input type="checkbox"/>            | Client devices                     | 11 dBm/MHz    |
| <input type="checkbox"/>            | 5.725~5.85 GHz                     | 30 dBm/500kHz |

#### 4.3.2. Measuring Instruments and Setting

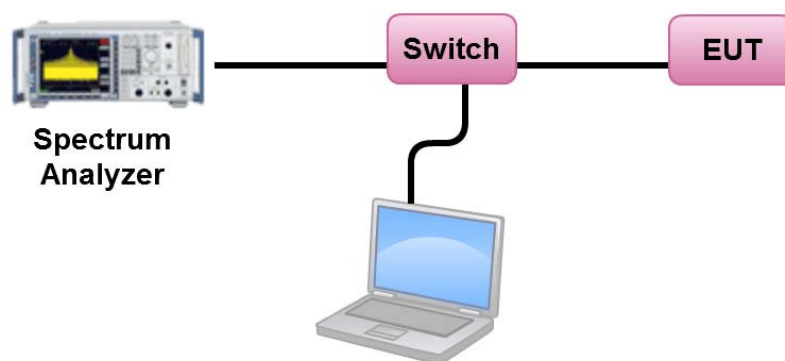
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter                                                                                                                                                                                                                                    | Setting                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| Attenuation                                                                                                                                                                                                                                           | Auto                                                         |
| Span Frequency                                                                                                                                                                                                                                        | Encompass the entire emissions bandwidth (EBW) of the signal |
| RBW                                                                                                                                                                                                                                                   | 1000 kHz                                                     |
| VBW                                                                                                                                                                                                                                                   | 3000 kHz                                                     |
| Detector                                                                                                                                                                                                                                              | RMS                                                          |
| Trace                                                                                                                                                                                                                                                 | AVERAGE                                                      |
| Sweep Time                                                                                                                                                                                                                                            | Auto                                                         |
| Trace Average                                                                                                                                                                                                                                         | 100 times                                                    |
| Note: If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10\log(500\text{kHz}/\text{RBW})$ to the measured result, whereas RBW ( $< 500$ kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement. |                                                              |

#### 4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB789033 D02 v01r02 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (F) Maximum Power Spectral Density (PSD).
3. Multiple antenna systems was performed in accordance KDB662911 D01 v02r01 in-Band Power Spectral Density (PSD) Measurements and sum the spectra across the outputs.
4. For 5.725~5.85 GHz, the measured result of PSD level must add  $10\log(500\text{kHz}/\text{RBW})$  and the final result should  $\leq 30 \text{ dBm}$ .

#### 4.3.4. Test Setup Layout



#### 4.3.5. Test Deviation

There is no deviation with the original standard.

#### 4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.3.7. Test Result of Power Spectral Density

|               |           |          |     |
|---------------|-----------|----------|-----|
| Temperature   | 20°C      | Humidity | 52% |
| Test Engineer | Jim Huang |          |     |

##### Configuration IEEE 802.11a / Ant. 3 + Ant. 4

| Channel | Frequency | Power Density (dBm/MHz) | Max. Limit (dBm/MHz) | Result   |
|---------|-----------|-------------------------|----------------------|----------|
| 36      | 5180 MHz  | 10.95                   | 16.62                | Complies |
| 40      | 5200 MHz  | 14.36                   | 16.62                | Complies |
| 48      | 5240 MHz  | 14.23                   | 16.62                | Complies |

##### Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4

| Channel | Frequency | Power Density (dBm/MHz) | Max. Limit (dBm/MHz) | Result   |
|---------|-----------|-------------------------|----------------------|----------|
| 36      | 5180 MHz  | 10.84                   | 16.62                | Complies |
| 40      | 5200 MHz  | 14.36                   | 16.62                | Complies |
| 48      | 5240 MHz  | 14.29                   | 16.62                | Complies |

##### Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4

| Channel | Frequency | Power Density (dBm/MHz) | Max. Limit (dBm/MHz) | Result   |
|---------|-----------|-------------------------|----------------------|----------|
| 38      | 5190 MHz  | 4.96                    | 16.62                | Complies |
| 46      | 5230 MHz  | 10.22                   | 16.62                | Complies |

##### Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4

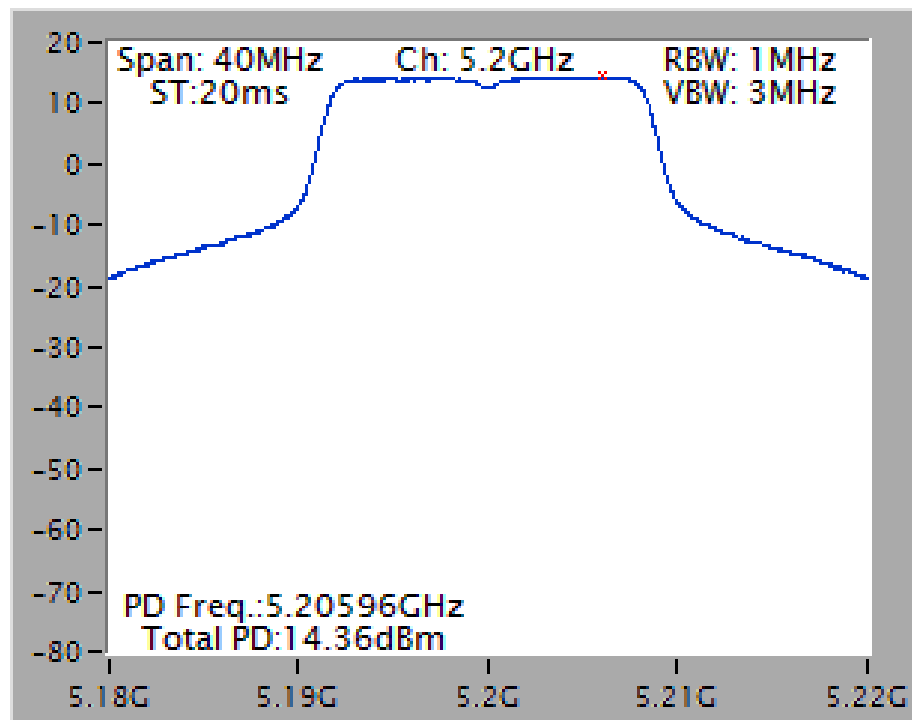
| Channel | Frequency | Power Density (dBm/MHz) | Max. Limit (dBm/MHz) | Result   |
|---------|-----------|-------------------------|----------------------|----------|
| 42      | 5210 MHz  | 0.94                    | 16.62                | Complies |

Note:  $Directional\ Gain = 10 \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{K=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 6.38 \text{ dBi} > 6 \text{ dBi}$ , so Limit =  $17 - (6.38 - 6) = 16.62 \text{ dBm/MHz}$ .

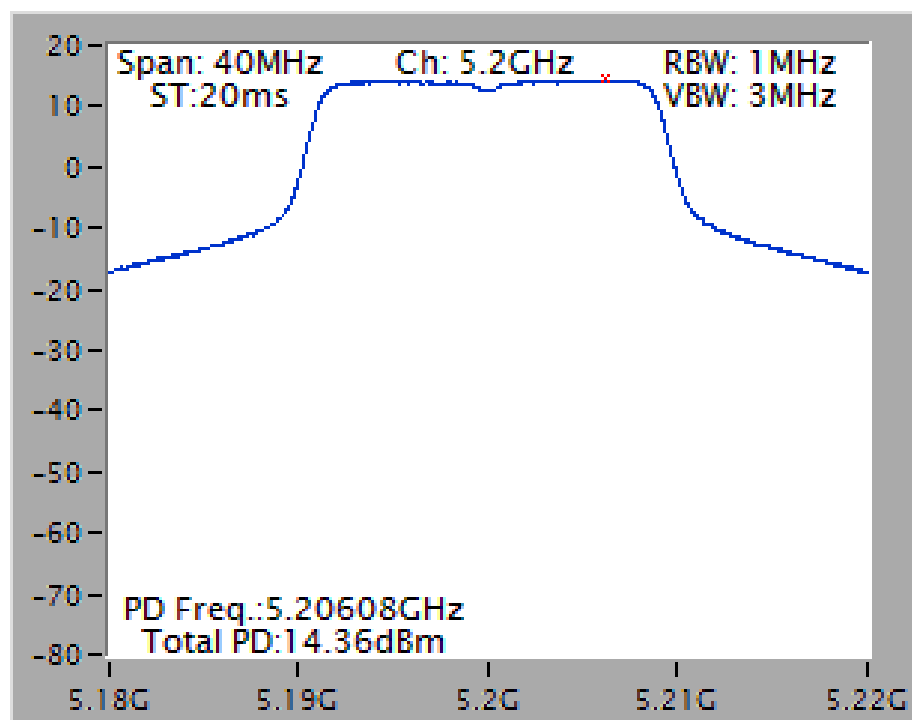
Note: All the test values were listed in the report.

For plots, only the channel with worse result was shown.

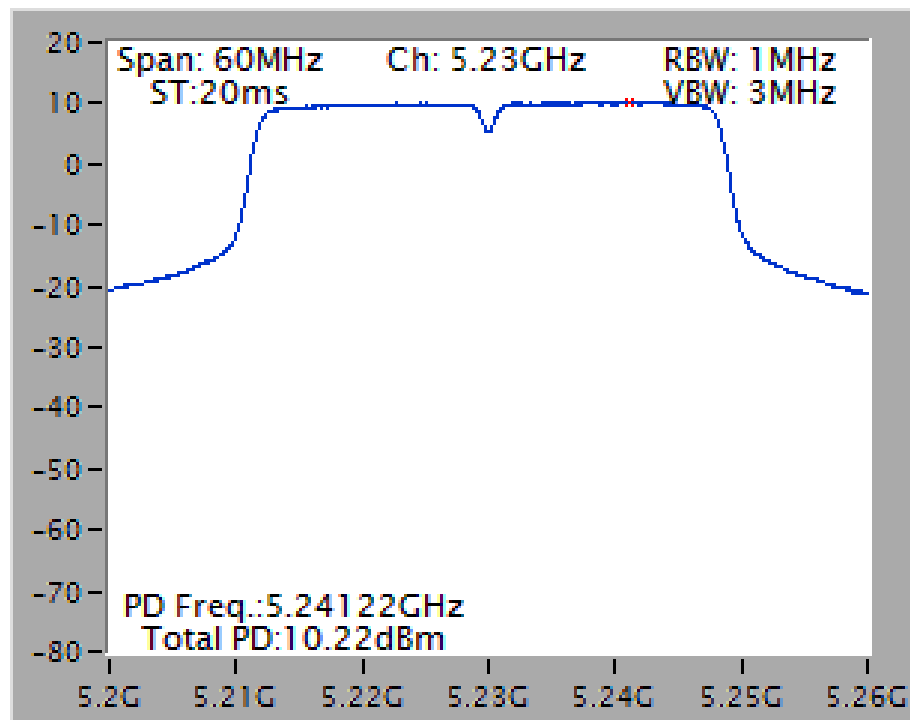
Power Density Plot on Configuration IEEE 802.11a / Ant. 3 + Ant. 4 / 5200 MHz



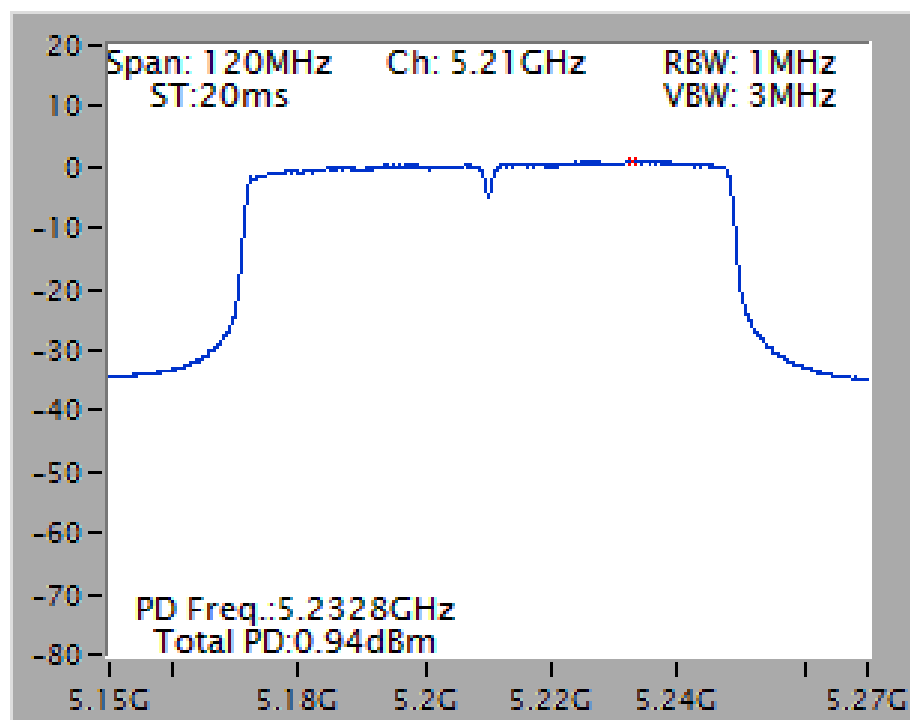
Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Ant. 3 + Ant. 4 / 5200 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Ant. 3 + Ant. 4 / 5230 MHz



Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Ant. 3 + Ant. 4 / 5210 MHz



## 4.4. Radiated Emissions Measurement

### 4.4.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

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<br>(MHz) | Field Strength<br>(microvolt/meter) | Measurement Distance<br>(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                                |

### 4.4.2. Measuring Instruments and Setting

Please refer to section 5 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                              | 40 GHz                                            |
| RBW / VBW (Emission in restricted band)     | 1 MHz / 3MHz for Peak,<br>1 MHz / 1/T for Average |
| RBW / VBW (Emission in non-restricted band) | 1 MHz / 3MHz for peak                             |

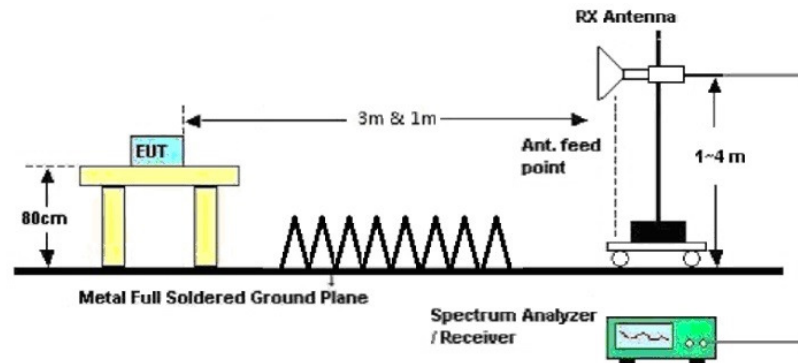
| Receiver Parameter     | Setting                           |
|------------------------|-----------------------------------|
| Attenuation            | Auto                              |
| Start ~ Stop Frequency | 9kHz~150kHz / RBW 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RBW 9kHz for QP    |
| Start ~ Stop Frequency | 30MHz~1000MHz / RBW 120kHz for QP |

#### 4.4.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. 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 1m & 3m 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 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. 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.
8. 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.
9. 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.

#### 4.4.4. Test Setup Layout

For Radiated Emissions: Above 1GHz



#### 4.4.5. Test Deviation

There is no deviation with the original standard.

#### 4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.



#### 4.4.7. Results for Radiated Emissions (1GHz~40GHz)

|               |               |                |                                         |
|---------------|---------------|----------------|-----------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                     |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11a CH 36 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                         |

##### Horizontal

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss Factor | Preamp Factor | Remark | A/Pos   | T/Pos | Pol/Phase      |
|---|----------|--------|------------|------------|------------|--------------------------|---------------|--------|---------|-------|----------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                       | dB/m          | dB     |         | cm    | deg            |
| 1 | 15540.00 | 44.48  | 54.00      | -9.52      | 31.18      | 10.77                    | 38.12         | 35.59  | Average | 100   | 360 HORIZONTAL |
| 2 | 15540.00 | 58.79  | 74.00      | -15.21     | 45.49      | 10.77                    | 38.12         | 35.59  | Peak    | 100   | 360 HORIZONTAL |

##### Vertical

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss Factor | Preamp Factor | Remark | A/Pos   | T/Pos | Pol/Phase   |
|---|----------|--------|------------|------------|------------|--------------------------|---------------|--------|---------|-------|-------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                       | dB/m          | dB     |         | cm    | deg         |
| 1 | 15540.00 | 44.39  | 54.00      | -9.61      | 31.09      | 10.77                    | 38.12         | 35.59  | Average | 100   | 65 VERTICAL |
| 2 | 15540.00 | 57.59  | 74.00      | -16.41     | 44.29      | 10.77                    | 38.12         | 35.59  | Peak    | 100   | 65 VERTICAL |

|               |               |                |                                         |
|---------------|---------------|----------------|-----------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                     |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11a CH 40 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                         |

#### Horizontal

|   | Freq     | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|----------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz      | dBuV/m | Line   | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
|   |          |        | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     |         |       |       |            |
| 1 | 15600.00 | 44.31  | 54.00  | -9.69  | 31.07 | 10.78 | 38.04   | 35.58  | Average | 162   | 360   | HORIZONTAL |
| 2 | 15600.00 | 59.58  | 74.00  | -14.42 | 46.34 | 10.78 | 38.04   | 35.58  | Peak    | 162   | 360   | HORIZONTAL |

#### Vertical

|   | Freq     | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |           |
|---|----------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz      | dBuV/m | Line   | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase |
|   |          |        | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     |         |       |       |           |
| 1 | 15600.00 | 46.54  | 54.00  | -7.46  | 33.30 | 10.78 | 38.04   | 35.58  | Average | 167   | 29    | VERTICAL  |
| 2 | 15600.00 | 62.15  | 74.00  | -11.85 | 48.91 | 10.78 | 38.04   | 35.58  | Peak    | 167   | 29    | VERTICAL  |

|               |               |                |                                         |
|---------------|---------------|----------------|-----------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                     |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11a CH 48 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                         |

### Horizontal

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 15720.00 | 48.49  | 54.00      | -5.51      | 35.41      | 10.79      | 37.85          | 35.56         | Average | 167   | 318   | HORIZONTAL |
| 2 | 15720.00 | 64.32  | 74.00      | -9.68      | 51.24      | 10.79      | 37.85          | 35.56         | Peak    | 167   | 318   | HORIZONTAL |

### Vertical

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |           |
| 1 | 15720.00 | 48.93  | 54.00      | -5.07      | 35.85      | 10.79      | 37.85          | 35.56         | Average | 181   | 0     | VERTICAL  |
| 2 | 15720.00 | 64.88  | 74.00      | -9.12      | 51.80      | 10.79      | 37.85          | 35.56         | Peak    | 181   | 0     | VERTICAL  |

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT20 CH 36 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

### Horizontal

|   | Freq     | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|----------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz      | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
| 1 | 15540.00 | 44.32  | 54.00 | -9.68  | 31.02 | 10.77 | 38.12   | 35.59  | Average | 100   | 246   | HORIZONTAL |
| 2 | 15540.00 | 57.89  | 74.00 | -16.11 | 44.59 | 10.77 | 38.12   | 35.59  | Peak    | 100   | 246   | HORIZONTAL |

### Vertical

|   | Freq     | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |           |
|---|----------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz      | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase |
| 1 | 15540.00 | 44.21  | 54.00 | -9.79  | 30.91 | 10.77 | 38.12   | 35.59  | Average | 100   | 322   | VERTICAL  |
| 2 | 15540.00 | 58.57  | 74.00 | -15.43 | 45.27 | 10.77 | 38.12   | 35.59  | Peak    | 100   | 322   | VERTICAL  |

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT20 CH 40 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

#### Horizontal

|   | Freq     | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|----------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV  | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
| 1 | 15600.00 | 43.43  | 54.00  | -10.57 | 30.19 | 10.78 | 38.04   | 35.58  | Average | 100   | 89    | HORIZONTAL |
| 2 | 15600.00 | 57.61  | 74.00  | -16.39 | 44.37 | 10.78 | 38.04   | 35.58  | Peak    | 100   | 89    | HORIZONTAL |

#### Vertical

|   | Freq     | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |           |
|---|----------|--------|--------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV  | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase |
| 1 | 15600.00 | 43.21  | 54.00  | -10.79 | 29.97 | 10.78 | 38.04   | 35.58  | Average | 100   | 193   | VERTICAL  |
| 2 | 15600.00 | 57.61  | 74.00  | -16.39 | 44.37 | 10.78 | 38.04   | 35.58  | Peak    | 100   | 193   | VERTICAL  |

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT20 CH 48 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

### Horizontal

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase  |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|------------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |            |
| 1 | 15720.00 | 44.51  | 54.00         | -9.49         | 31.43         | 10.79                       | 37.85            | 35.56 Average | 101   | 54    | HORIZONTAL |
| 2 | 15720.00 | 57.20  | 74.00         | -16.80        | 44.12         | 10.79                       | 37.85            | 35.56 Peak    | 100   | 54    | HORIZONTAL |

### Vertical

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|-----------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |           |
| 1 | 15720.00 | 44.04  | 54.00         | -9.96         | 30.96         | 10.79                       | 37.85            | 35.56 Average | 100   | 153   | VERTICAL  |
| 2 | 15720.00 | 58.51  | 74.00         | -15.49        | 45.43         | 10.79                       | 37.85            | 35.56 Peak    | 100   | 153   | VERTICAL  |

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT40 CH 38 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

#### Horizontal

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase  |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|------------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |            |
| 1 | 15539.04 | 44.70  | 54.00         | -9.30         | 31.40         | 10.77                       | 38.12            | 35.59 Average | 100   | 153   | HORIZONTAL |
| 2 | 15540.50 | 58.19  | 74.00         | -15.81        | 44.89         | 10.77                       | 38.12            | 35.59 Peak    | 100   | 153   | HORIZONTAL |

#### Vertical

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|-----------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |           |
| 1 | 15539.36 | 44.49  | 54.00         | -9.51         | 31.19         | 10.77                       | 38.12            | 35.59 Average | 100   | 123   | VERTICAL  |
| 2 | 15540.76 | 58.05  | 74.00         | -15.95        | 44.75         | 10.77                       | 38.12            | 35.59 Peak    | 100   | 123   | VERTICAL  |

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT40 CH 46 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

#### Horizontal

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase  |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|------------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |            |
| 1 | 15689.40 | 44.02  | 54.00         | -9.98         | 30.88         | 10.79                       | 37.91            | 35.56 Average | 100   | 265   | HORIZONTAL |
| 2 | 15690.28 | 57.60  | 74.00         | -16.40        | 44.46         | 10.79                       | 37.91            | 35.56 Peak    | 100   | 265   | HORIZONTAL |

#### Vertical

|   | Freq     | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark        | A/Pos | T/Pos | Pol/Phase |
|---|----------|--------|---------------|---------------|---------------|-----------------------------|------------------|---------------|-------|-------|-----------|
|   | MHz      | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB            | cm    | deg   |           |
| 1 | 15689.08 | 57.46  | 74.00         | -16.54        | 44.32         | 10.79                       | 37.91            | 35.56 Peak    | 100   | 216   | VERTICAL  |
| 2 | 15690.88 | 43.85  | 54.00         | -10.15        | 30.71         | 10.79                       | 37.91            | 35.56 Average | 100   | 216   | VERTICAL  |



|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT80 CH 42 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 06, 2014 |                |                                                          |

#### Horizontal

|   | Freq     | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|----------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz      | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
| 1 | 15629.49 | 42.72  | 54.00 | -11.28 | 29.52 | 10.78 | 37.99   | 35.57  | Average | 100   | 120   | HORIZONTAL |
| 2 | 15629.80 | 57.97  | 74.00 | -16.03 | 44.77 | 10.78 | 37.99   | 35.57  | Peak    | 100   | 120   | HORIZONTAL |

#### Vertical

|   | Freq     | Level  | Limit | Over   | Read  | Cable | Antenna | Preamp |         | A/Pos | T/Pos |           |
|---|----------|--------|-------|--------|-------|-------|---------|--------|---------|-------|-------|-----------|
|   | MHz      | dBuV/m | Line  | Limit  | Level | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase |
| 1 | 15630.91 | 57.92  | 74.00 | -16.08 | 44.72 | 10.78 | 37.99   | 35.57  | Peak    | 100   | 254   | VERTICAL  |
| 2 | 15630.97 | 42.71  | 54.00 | -11.29 | 29.51 | 10.78 | 37.99   | 35.57  | Average | 100   | 254   | VERTICAL  |

#### Note:

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

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

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

## 4.5. Band Edge Emissions Measurement

### 4.5.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of  $-27$  dBm/MHz.

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<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(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                                |

### 4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter                                  | Setting                                           |
|-----------------------------------------------------|---------------------------------------------------|
| Attenuation                                         | Auto                                              |
| Span Frequency                                      | 100 MHz                                           |
| RBW / VBW (Emission in restricted band)             | 1 MHz / 3MHz for Peak,<br>1 MHz / 1/T for Average |
| RBW / VBW (Emission in non-restricted band)         | 1 MHz / 3MHz for Peak                             |
| RBW / VBW (30dBc in any 100 kHz bandwidth emission) | 100 kHz / 300 kHz for Peak                        |

### 4.5.3. Test Procedures

The test procedure is the same as section 4.4.3.

### 4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.4.4.

### 4.5.5. Test Deviation

There is no deviation with the original standard.

### 4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.5.7. Test Result of Band Edge and Fundamental Emissions

|               |               |                |                                                 |
|---------------|---------------|----------------|-------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                             |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11a CH 36, 40, 48 /<br>Ant. 3 + Ant. 4 |
| Test Date     | Sep. 04, 2014 |                |                                                 |

##### Channel 36

|   | Freq    | Level  | Limit  | Over  | Read   | CableAntenna | Preamp |        | A/Pos   | T/Pos |               |
|---|---------|--------|--------|-------|--------|--------------|--------|--------|---------|-------|---------------|
|   | MHz     | dBuV/m | Line   | Limit | Level  | Loss         | Factor | Factor | Remark  | cm    | deg           |
|   |         |        | dBuV/m | dB    | dBuV   | dB           | dB/m   | dB     |         |       | Pol/Phase     |
| 1 | 5149.60 | 68.71  | 74.00  | -5.29 | 63.77  | 6.13         | 34.01  | 35.20  | Peak    | 180   | 59 HORIZONTAL |
| 2 | 5150.00 | 52.24  | 54.00  | -1.76 | 47.30  | 6.13         | 34.01  | 35.20  | Average | 180   | 59 HORIZONTAL |
| 3 | 5201.20 | 109.22 |        |       | 104.15 | 6.16         | 34.11  | 35.20  | Average | 180   | 59 HORIZONTAL |
| 4 | 5206.40 | 118.38 |        |       | 113.31 | 6.16         | 34.11  | 35.20  | Peak    | 180   | 59 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5180 MHz.

##### Channel 40

|   | Freq    | Level  | Limit  | Over  | Read   | CableAntenna | Preamp |        | A/Pos   | T/Pos |               |
|---|---------|--------|--------|-------|--------|--------------|--------|--------|---------|-------|---------------|
|   | MHz     | dBuV/m | Line   | Limit | Level  | Loss         | Factor | Factor | Remark  | cm    | deg           |
|   |         |        | dBuV/m | dB    | dBuV   | dB           | dB/m   | dB     |         |       | Pol/Phase     |
| 1 | 5149.60 | 68.71  | 74.00  | -5.29 | 63.77  | 6.13         | 34.01  | 35.20  | Peak    | 180   | 59 HORIZONTAL |
| 2 | 5150.00 | 52.24  | 54.00  | -1.76 | 47.30  | 6.13         | 34.01  | 35.20  | Average | 180   | 59 HORIZONTAL |
| 3 | 5201.20 | 109.22 |        |       | 104.15 | 6.16         | 34.11  | 35.20  | Average | 180   | 59 HORIZONTAL |
| 4 | 5206.40 | 118.38 |        |       | 113.31 | 6.16         | 34.11  | 35.20  | Peak    | 180   | 59 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5200 MHz.

##### Channel 48

|   | Freq    | Level  | Limit  | Over   | Read   | CableAntenna | Preamp |        | A/Pos   | T/Pos |               |
|---|---------|--------|--------|--------|--------|--------------|--------|--------|---------|-------|---------------|
|   | MHz     | dBuV/m | Line   | Limit  | Level  | Loss         | Factor | Factor | Remark  | cm    | deg           |
|   |         |        | dBuV/m | dB     | dBuV   | dB           | dB/m   | dB     |         |       | Pol/Phase     |
| 1 | 5149.20 | 59.52  | 74.00  | -14.48 | 54.58  | 6.13         | 34.01  | 35.20  | Peak    | 184   | 52 HORIZONTAL |
| 2 | 5150.00 | 46.86  | 54.00  | -7.14  | 41.92  | 6.13         | 34.01  | 35.20  | Average | 184   | 52 HORIZONTAL |
| 3 | 5236.00 | 118.48 |        |        | 113.32 | 6.18         | 34.18  | 35.20  | Peak    | 184   | 52 HORIZONTAL |
| 4 | 5236.40 | 109.20 |        |        | 104.04 | 6.18         | 34.18  | 35.20  | Average | 184   | 52 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5240 MHz.

|               |               |                |                                                               |
|---------------|---------------|----------------|---------------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                           |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT20 CH 36, 40, 48 / Ant. 3 + Ant. 4 |
| Test Date     | Sep. 04, 2014 |                |                                                               |

#### Channel 36

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|--------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m   | dB            |         | cm    | deg   |            |
| 1 | 5147.90 | 69.48  | 74.00      | -4.52      | 64.54      | 6.13              | 34.01  | 35.20         | Peak    | 191   | 50    | HORIZONTAL |
| 2 | 5150.00 | 53.94  | 54.00      | -0.06      | 49.00      | 6.13              | 34.01  | 35.20         | Average | 191   | 50    | HORIZONTAL |
| 3 | 5175.80 | 115.77 |            |            | 110.78     | 6.15              | 34.04  | 35.20         | Peak    | 191   | 50    | HORIZONTAL |
| 4 | 5176.10 | 103.86 |            |            | 98.87      | 6.15              | 34.04  | 35.20         | Average | 191   | 50    | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5180 MHz.

#### Channel 40

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss Factor | Preamp<br>Factor | Remark | A/Pos   | T/Pos | Pol/Phase |            |
|---|---------|--------|---------------|---------------|---------------|-----------------------------|------------------|--------|---------|-------|-----------|------------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                          | dB/m             | dB     |         | cm    | deg       |            |
| 1 | 5149.20 | 70.92  | 74.00         | -3.08         | 65.98         | 6.13                        | 34.01            | 35.20  | Peak    | 180   | 55        | HORIZONTAL |
| 2 | 5150.00 | 53.96  | 54.00         | -0.04         | 49.02         | 6.13                        | 34.01            | 35.20  | Average | 180   | 55        | HORIZONTAL |
| 3 | 5194.40 | 120.41 |               |               | 115.37        | 6.16                        | 34.08            | 35.20  | Peak    | 180   | 55        | HORIZONTAL |
| 4 | 5194.80 | 108.76 |               |               | 103.69        | 6.16                        | 34.11            | 35.20  | Average | 180   | 55        | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5200 MHz.

#### Channel 48

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss Factor | Preamp Factor | Remark | A/Pos   | T/Pos | Pol/Phase     |
|---|---------|--------|------------|------------|------------|--------------------------|---------------|--------|---------|-------|---------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                       | dB/m          | dB     |         | cm    | deg           |
| 1 | 5146.40 | 47.40  | 54.00      | -6.60      | 42.46      | 6.13                     | 34.01         | 35.20  | Average | 183   | 56 HORIZONTAL |
| 2 | 5150.00 | 60.43  | 74.00      | -13.57     | 55.49      | 6.13                     | 34.01         | 35.20  | Peak    | 183   | 56 HORIZONTAL |
| 3 | 5234.00 | 109.66 |            |            | 104.50     | 6.18                     | 34.18         | 35.20  | Average | 183   | 56 HORIZONTAL |
| 4 | 5235.20 | 121.33 |            |            | 116.17     | 6.18                     | 34.18         | 35.20  | Peak    | 183   | 56 HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5240 MHz.

|               |               |                |                                                              |
|---------------|---------------|----------------|--------------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                          |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT40<br>CH 38, 46 / Ant. 3 + Ant. 4 |
| Test Date     | Sep. 04, 2014 |                |                                                              |

### Channel 38

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 5148.40 | 53.48  | 54.00      | -0.52      | 48.54      | 6.13       | 34.01          | 35.20         | Average | 189   | 55    | HORIZONTAL |
| 2 | 5148.80 | 68.53  | 74.00      | -5.47      | 63.59      | 6.13       | 34.01          | 35.20         | Peak    | 189   | 55    | HORIZONTAL |
| 3 | 5186.40 | 111.17 |            |            | 106.14     | 6.15       | 34.08          | 35.20         | Peak    | 189   | 55    | HORIZONTAL |
| 4 | 5203.20 | 101.15 |            |            | 96.08      | 6.16       | 34.11          | 35.20         | Average | 189   | 55    | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5190 MHz.

### Channel 46

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | Remark  | A/Pos | T/Pos | Pol/Phase  |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            |         | cm    | deg   |            |
| 1 | 5150.00 | 53.98  | 54.00      | -0.02      | 49.04      | 6.13       | 34.01          | 35.20         | Average | 189   | 53    | HORIZONTAL |
| 2 | 5150.00 | 68.63  | 74.00      | -5.37      | 63.69      | 6.13       | 34.01          | 35.20         | Peak    | 189   | 53    | HORIZONTAL |
| 3 | 5234.80 | 107.02 |            |            | 101.86     | 6.18       | 34.18          | 35.20         | Average | 189   | 53    | HORIZONTAL |
| 4 | 5234.80 | 116.79 |            |            | 111.63     | 6.18       | 34.18          | 35.20         | Peak    | 189   | 53    | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5230 MHz.

|               |               |                |                                                          |
|---------------|---------------|----------------|----------------------------------------------------------|
| Temperature   | 25.1°C        | Humidity       | 50%                                                      |
| Test Engineer | Mars Lin      | Configurations | IEEE 802.11ac MCS0/Nss1 VHT80<br>CH 42 / Ant. 3 + Ant. 4 |
| Test Date     | Sep. 04, 2014 |                |                                                          |

#### Channel 42

|   | Freq    | Level  | Limit | Over  | Read   | Cable | Antenna | Preamp |         | A/Pos | T/Pos |            |
|---|---------|--------|-------|-------|--------|-------|---------|--------|---------|-------|-------|------------|
|   | MHz     | dBuV/m | Line  | Limit | Level  | Loss  | Factor  | Factor | Remark  | cm    | deg   | Pol/Phase  |
| 1 | 5138.00 | 66.69  | 74.00 | -7.31 | 61.79  | 6.12  | 33.98   | 35.20  | Peak    | 182   | 295   | HORIZONTAL |
| 2 | 5146.80 | 53.65  | 54.00 | -0.35 | 48.71  | 6.13  | 34.01   | 35.20  | Average | 182   | 295   | HORIZONTAL |
| 3 | 5198.80 | 110.28 |       |       | 105.21 | 6.16  | 34.11   | 35.20  | Peak    | 182   | 295   | HORIZONTAL |
| 4 | 5226.80 | 96.88  |       |       | 91.75  | 6.18  | 34.15   | 35.20  | Average | 182   | 295   | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5210 MHz.

#### Note:

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

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

## 4.6. Frequency Stability Measurement

### 4.6.1. Limit

In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

The transmitter center frequency tolerance shall be  $\pm 20$  ppm maximum for the 5 GHz band (IEEE 802.11n specification).

### 4.6.2. Measuring Instruments and Setting

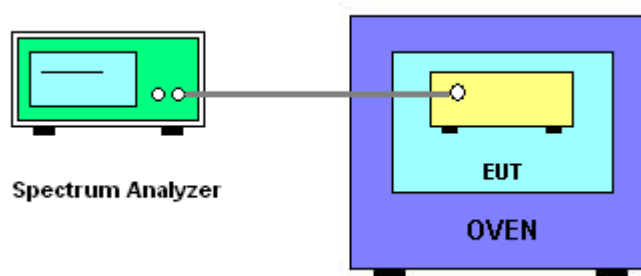
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting                                          |
|--------------------|--------------------------------------------------|
| Attenuation        | Auto                                             |
| Span Frequency     | Entire absence of modulation emissions bandwidth |
| RBW                | 10 kHz                                           |
| VBW                | 10 kHz                                           |
| Sweep Time         | Auto                                             |

### 4.6.3. 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  $(f_c - f)/f_c \times 10^6$  ppm and the limit is less than  $\pm 20$  ppm (IEEE 802.11n specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature is  $0^\circ\text{C} \sim 50^\circ\text{C}$ .

### 4.6.4. Test Setup Layout



#### 4.6.5. Test Deviation

There is no deviation with the original standard.

#### 4.6.6. EUT Operation during Test

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

#### 4.6.7. Test Result of Frequency Stability

|               |          |           |               |
|---------------|----------|-----------|---------------|
| Temperature   | 20°C     | Humidity  | 52%           |
| Test Engineer | Mars Lin | Test Date | Sep. 18, 2014 |

Mode: 20 MHz

##### Voltage vs. Frequency Stability

| Voltage              | Measurement Frequency (MHz) |
|----------------------|-----------------------------|
| (V)                  | 5200 MHz                    |
| 126.50               | 5199.9732                   |
| 110.00               | 5199.9875                   |
| 93.50                | 5199.9964                   |
| Max. Deviation (MHz) | 0.026800                    |
| Max. Deviation (ppm) | 5.15                        |

##### Temperature vs. Frequency Stability

| Temperature          | Measurement Frequency (MHz) |
|----------------------|-----------------------------|
| (°C)                 | 5200 MHz                    |
| 0                    | 5199.9798                   |
| 10                   | 5199.9844                   |
| 20                   | 5199.9875                   |
| 30                   | 5200.0058                   |
| 40                   | 5200.0134                   |
| 50                   | 5200.0212                   |
| Max. Deviation (MHz) | 0.021200                    |
| Max. Deviation (ppm) | 4.08                        |



## **4.7. Antenna Requirements**

### **4.7.1. Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### **4.7.2. Antenna Connector Construction**

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

## 5. LIST OF MEASURING EQUIPMENTS

| Instrument                 | Manufacturer | Model No.     | Serial No.  | Characteristics  | Calibration Date | Remark                |
|----------------------------|--------------|---------------|-------------|------------------|------------------|-----------------------|
| Horn Antenna               | EMCO         | 3115          | 00075790    | 750MHz~18GHz     | Nov. 01, 2013    | Radiation (03CH01-CB) |
| Horn Antenna               | SCHWARZBEAK  | BBHA 9170     | BBHA9170252 | 15GHz ~ 40GHz    | Dec. 17, 2013    | Radiation (03CH01-CB) |
| Pre-Amplifier              | Agilent      | 8449B         | 3008A02310  | 1GHz ~ 26.5GHz   | Dec. 16, 2013    | Radiation (03CH01-CB) |
| Pre-Amplifier              | WM           | TF-130N-R1    | 923365      | 26GHz ~ 40GHz    | Oct. 23, 2013    | Radiation (03CH01-CB) |
| Spectrum analyzer          | R&S          | FSP40         | 100019      | 9kHz~40GHz       | Dec. 02, 2013    | Radiation (03CH01-CB) |
| Turn Table                 | INN CO       | CO 2000       | N/A         | 0 ~ 360 degree   | N.C.R            | Radiation (03CH01-CB) |
| Antenna Mast               | INN CO       | CO2000        | N/A         | 1 m - 4 m        | N.C.R            | Radiation (03CH01-CB) |
| RF Cable-high              | Woken        | High Cable-3  | N/A         | 1GHz – 40GHz     | Nov. 17, 2013    | Radiation (03CH01-CB) |
| RF Cable-high              | Woken        | High Cable-4  | N/A         | 1GHz - 40GHz     | Nov. 17, 2013    | Radiation (03CH01-CB) |
| Signal analyzer            | R&S          | FSV40         | 100979      | 9kHz~40GHz       | Nov. 29, 2013    | Conducted (TH01-CB)   |
| Signal analyzer            | Agilent      | N9010A        | MY52220519  | 10Hz~44GHz       | Dec. 11, 2013    | Conducted (TH01-CB)   |
| Temp. and Humidity Chamber | Ten Billion  | TTH-D3SP      | TBN-931011  | -30~100 degree   | Jun. 03, 2014    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | High Cable-7  | -           | 1 GHz – 26.5 GHz | Nov. 17, 2013    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | High Cable-8  | -           | 1 GHz – 26.5 GHz | Nov. 17, 2013    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | High Cable-9  | -           | 1 GHz – 26.5 GHz | Nov. 17, 2013    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | High Cable-10 | -           | 1 GHz – 26.5 GHz | Nov. 17, 2013    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | High Cable-11 | -           | 1 GHz – 26.5 GHz | Nov. 17, 2013    | Conducted (TH01-CB)   |
| Power Sensor               | Anritsu      | MA2411B       | 1126203     | 300MHz~40GHz     | Sep. 30, 2013    | Conducted (TH01-CB)   |
| Power Meter                | Anritsu      | ML2495A       | 1210004     | 300MHz~40GHz     | Sep. 30, 2013    | Conducted (TH01-CB)   |

Note: Calibration Interval of instruments listed above is one year.

N.C.R means Non-Calibration required.

## 6. MEASUREMENT UNCERTAINTY

| Test Items                        | Uncertainty | Remark                   |
|-----------------------------------|-------------|--------------------------|
| Radiated Emission (1GHz ~ 18GHz)  | 3.7 dB      | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz) | 3.5 dB      | Confidence levels of 95% |
| Conducted Emission                | 1.7 dB      | Confidence levels of 95% |