



# SPORTON International Inc.

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## FCC RADIO TEST REPORT

|                        |  |
|------------------------|--|
| Applicant's company    | Realtek Semiconductor Corp.  |
| Applicant Address      | No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan |
| FCC ID                 | TX2RTL8812AENF   |
| Manufacturer's company | Realtek Semiconductor Corp.  |
| Manufacturer Address   | No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan |

|                   |   |
|-------------------|---|
| Product Name      | 802.11a/b/g/n/ac RTL8812AENF Combo module         |
| Brand Name        | REALTEK   |
| Model No.         | RTL8812AENF                                       |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart E § 15.407             |
| Test Freq. Range  | 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850 MHz |
| Received Date     | Mar. 07, 2014                                     |
| Final Test Date   | Jan. 13, 2016                                     |
| 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 C63.10-2013, 47 CFR FCC Part 15 Subpart E, KDB789033 D02 v01r01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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





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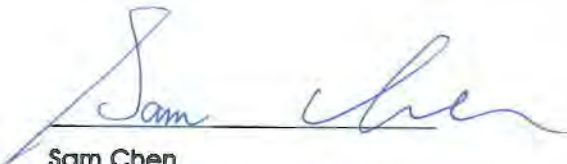
## History of This Test Report

| REPORT NO.    | VERSION | DESCRIPTION             | ISSUED DATE   |
|---------------|---------|-------------------------|---------------|
| FR422118-06AC | Rev. 01 | Initial issue of report | Jan. 21, 2016 |
|               |         |                         |               |
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## 1. VERIFICATION OF COMPLIANCE

Product Name : 802.11 a/b/g/n/ac RTL8812AENF Combo module  
Brand Name : REALTEK  
Model No. : RTL8812AENF  
Applicant : Realtek Semiconductor Corp.  
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. 07, 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   | Under Limit |
| 4.1  | 15.207       | AC Power Line Conducted Emissions                  | Complies | 14.29 dB    |
| 4.2  | 15.407(a)    | 26dB Spectrum Bandwidth and 99% Occupied Bandwidth | Complies | -           |
| 4.3  | 15.407(e)    | 6dB Spectrum Bandwidth                             | Complies | -           |
| 4.4  | 15.407(a)    | Maximum Conducted Output Power                     | Complies | 7.22 dB     |
| 4.5  | 15.407(a)    | Power Spectral Density                             | Complies | 23.41 dB    |
| 4.6  | 15.407(b)    | Radiated Emissions                                 | Complies | 3.15 dB     |
| 4.7  | 15.407(b)    | Band Edge Emissions                                | Complies | 1.53 dB     |
| 4.8  | 15.407(g)    | Frequency Stability                                | Complies | -           |
| 4.9  | 15.203       | Antenna Requirements                               | Complies | -           |

### 3. GENERAL INFORMATION

#### 3.1. Product Details

| Items                          | Description  |
|--------------------------------|--|
| Product Type                   | WLAN (1TX/2TX, 2RX)  |
| Radio Type                     | Intentional Transceiver  |
| Power Type                     | From host system   |
| 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                | 5250 ~ 5350MHz / 5470 ~ 5725MHz / 5725 ~ 5850 MHz  |
| Channel Number                 | 21 for 20MHz bandwidth ; 9 for 40MHz bandwidth<br>4 for 80MHz bandwidth  |
| Channel Band Width (99%)       | For Non-beamforming mode<br>For 1TX:<br>IEEE 802.11a: 17.11 MHz<br>For 2TX:<br>IEEE 802.11a: 18.58 MHz<br>For beamforming mode<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 18.49 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 37.77 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 75.54 MHz |
| Maximum Conducted Output Power | For Non-beamforming mode<br>For 1TX:<br>IEEE 802.11a: 17.83 dBm<br>For 2TX:<br>IEEE 802.11a: 20.69 dBm<br>For beamforming mode<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 20.77 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 20.73 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 16.41 dBm |
| Carrier Frequencies            | Please refer to section 3.4  |
| Antenna                        | Please refer to section 3.3  |

| Items                | Description  |  |
|----------------------|--|--|
| Beamforming Function | <input checked="" type="checkbox"/> With beamforming | <input type="checkbox"/> Without beamforming |

Note: The product has beamforming function for 802.11n in 2.4G and 11n/ac in 5GHz.

### Antenna and Band width

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

### IEEE 11n/ac Spec.

| Protocol         | Number of Transmit Chains (NTX) | Data Rate / MCS               |
|------------------|---------------------------------|-------------------------------|
| 802.11n (HT20)   | 1 / 2                           | MCS 0-7 / 0-15                |
| 802.11n (HT40)   | 1 / 2                           | MCS 0-7 / 0-15                |
| 802.11ac (VHT20) | 1 / 2                           | MCS 0-8/Nss1 / MCS 0-8/Nss1-2 |
| 802.11ac (VHT40) | 1 / 2                           | MCS 0-9/Nss1 / MCS 0-9/Nss1-2 |
| 802.11ac (VHT80) | 1 / 2                           | MCS 0-9/Nss1 / MCS 0-9/Nss1-2 |

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput).  
Then EUT support HT20 and HT40.

Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT support VHT20, VHT40 and VHT80.

Note 3: Modulation modes consist of below configuration:  
HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac

## 3.2. Accessories

N/A

### 3.3. Table for Filed Antenna

| Ant. | Brand   | Model Name           | Antenna Type | Connector | Gain (dBi) |      |
|------|---------|----------------------|--------------|-----------|------------|------|
|      |         |                      |              |           | 2.4GHz     | 5GHz |
| 1    | LYNwave | ALA110-222050-300011 | PIFA Antenna | IPEX MHF4 | 3.5        | 5    |

**<For 2.4GHz Band>**

**For IEEE 802.11b mode (1TX, 1RX)**

Only Chain 1 can be used as transmitting/receiving antenna.

**For IEEE 802.11g mode (1TX/2TX, 2RX)**

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

Both Chain 1 and Chain 2 can be used as transmitting/receiving antenna.

Chain 1 and Chain 2 could both transmit/receive simultaneously.

**For IEEE 802.11n mode (1TX/2TX, 2RX)**

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

Both Chain 1 and Chain 2 can be used as transmitting/receiving antenna.

Chain 1 and Chain 2 could both transmit/receive simultaneously.

Only 2TX function was selected to test and record in the report, the 1TX test results were covered by 2TX test results.

**<For 5GHz Band>**

**For IEEE 802.11a mode (1TX/2TX, 2RX):**

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

For 2TX

Both Chain 1 and Chain 2 can be used as transmitting/receiving antenna.

Chain 1 and Chain 2 could both transmit/receive simultaneously.



**For IEEE 802.11n/ac mode (1TX/2TX, 2RX):**

The EUT can support both 1TX and 2TX functions.

For 1TX

Only Chain 1 can be used as transmitting antenna.

Chain 1 and Chain 2 could receive simultaneously.

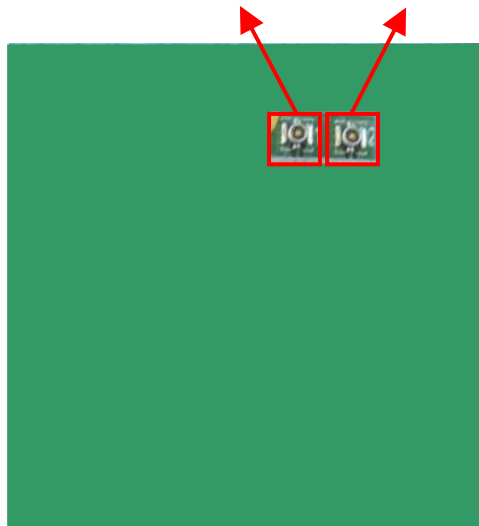
For 2TX

Both Chain 1 and Chain 2 can be used as transmitting/receiving antenna.

Chain 1 and Chain 2 could both transmit/receive simultaneously.

Only 2TX function was selected to test and record in the report, the 1TX test results were covered by 2TX test results.

**Chain 1 (Connect to Ant 1 for WLAN 2.4G / 5G) Chain 2 (Connect to Ant 1 for WLAN 2.4G / 5G / BT)**



### 3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 54, 62, 102, 110, 118, 126, 134, 151, 159.

For 80MHz bandwidth systems, use Channel 58, 106, 122, 155.

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5250~5350 MHz<br>Band 2 | 52          | 5260 MHz  | 60          | 5300 MHz  |
|                         | 54          | 5270 MHz  | 62          | 5310 MHz  |
|                         | 56          | 5280 MHz  | 64          | 5320 MHz  |
|                         | 58          | 5290 MHz  | -           | -         |
| 5470~5725 MHz<br>Band 3 | 100         | 5500 MHz  | 120         | 5600 MHz  |
|                         | 102         | 5510 MHz  | 122         | 5610 MHz  |
|                         | 104         | 5520 MHz  | 124         | 5620 MHz  |
|                         | 106         | 5530 MHz  | 126         | 5630 MHz  |
|                         | 108         | 5540 MHz  | 128         | 5640 MHz  |
|                         | 110         | 5550 MHz  | 132         | 5660 MHz  |
|                         | 112         | 5560 MHz  | 134         | 5670 MHz  |
|                         | 116         | 5580 MHz  | 136         | 5680 MHz  |
|                         | 118         | 5590 MHz  | 140         | 5700 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   | Chain       |          |
|--|--------------------------|-----------|-----------|-------------|----------|
| AC Power Conducted Emission                                  | Normal Link              | -         | -         | -           |          |
| Max. Conducted Output Power                                  | For non-beamforming mode |           |           |             |          |
|  | 11a/BPSK                 | Band 4    | 6Mbps     | 149/157/165 | 1<br>1+2 |
|  | For beamforming mode     |           |           |             |          |
|  | 11ac VHT20               | Band 4    | MCS0/Nss1 | 149/157/165 | 1+2      |
|  | 11ac VHT40               | Band 4    | MCS0/Nss1 | 151/159     | 1+2      |
|  | 11ac VHT80               | Band 4    | MCS0/Nss1 | 155         | 1+2      |
| Power Spectral Density                                       | For non-beamforming mode |           |           |             |          |
|  | 11a/BPSK                 | Band 4    | 6Mbps     | 149/157/165 | 1<br>1+2 |
|  | For beamforming mode     |           |           |             |          |
|  | 11ac VHT20               | Band 4    | MCS0/Nss1 | 149/157/165 | 1+2      |
|  | 11ac VHT40               | Band 4    | MCS0/Nss1 | 151/159     | 1+2      |
|  | 11ac VHT80               | Band 4    | MCS0/Nss1 | 155         | 1+2      |
| 26dB Spectrum Bandwidth & 99% Occupied Bandwidth Measurement | For non-beamforming mode |           |           |             |          |
|  | 11a/BPSK                 | Band 4    | 6Mbps     | 149/157/165 | 1<br>1+2 |
|  | For beamforming mode     |           |           |             |          |
|  | 11ac VHT20               | Band 4    | MCS0/Nss1 | 149/157/165 | 1+2      |
|  | 11ac VHT40               | Band 4    | MCS0/Nss1 | 151/159     | 1+2      |
|  | 11ac VHT80               | Band 4    | MCS0/Nss1 | 155         | 1+2      |
| 6dB Spectrum Bandwidth Measurement                           | For non-beamforming mode |           |           |             |          |
|  | 11a/BPSK                 | Band 4    | 6Mbps     | 149/157/165 | 1<br>1+2 |
|  | For beamforming mode     |           |           |             |          |
|  | 11ac VHT20               | Band 4    | MCS0/Nss1 | 149/157/165 | 1+2      |
|  | 11ac VHT40               | Band 4    | MCS0/Nss1 | 151/159     | 1+2      |
|  | 11ac VHT80               | Band 4    | MCS0/Nss1 | 155         | 1+2      |
| Radiated Emission Below 1GHz                                 | Normal Link              | -         | -         | -           |          |

|                              |                          |        |           |             |          |
|------------------------------|--------------------------|--------|-----------|-------------|----------|
| Radiated Emission Above 1GHz | For non-beamforming mode |        |           |             |          |
|                              | 11a/BPSK                 | Band 4 | 6Mbps     | 149/157/165 | 1<br>1+2 |
|                              | For beamforming mode     |        |           |             |          |
|                              | 11ac VHT20               | Band 4 | MCS0/Nss1 | 149/157/165 | 1+2      |
|                              | 11ac VHT40               | Band 4 | MCS0/Nss1 | 151/159     | 1+2      |
|                              | 11ac VHT80               | Band 4 | MCS0/Nss1 | 155         | 1+2      |
| Band Edge Emission           | For non-beamforming mode |        |           |             |          |
|                              | 11a/BPSK                 | Band 4 | 6Mbps     | 149/157/165 | 1<br>1+2 |
|                              | For beamforming mode     |        |           |             |          |
|                              | 11ac VHT20               | Band 4 | MCS0/Nss1 | 149/157/165 | 1+2      |
|                              | 11ac VHT40               | Band 4 | MCS0/Nss1 | 151/159     | 1+2      |
|                              | 11ac VHT80               | Band 4 | MCS0/Nss1 | 155         | 1+2      |
| Frequency Stability          | 20 MHz                   | Band 4 | -         | 157         | 1        |
|                              | 40 MHz                   | Band 4 | -         | 151         | 1        |
|                              | 80 MHz                   | Band 4 | -         | 155         | 1        |

Note 1: VHT20/VHT40 covers HT20/HT40, due to same modulation. The power setting for 802.11n HT20 and HT40 are the same or lower than 802.11ac VHT20 and VHT40.

Note 2: There are two modes of EUT, one is beamforming mode, and the other is non-beamforming mode for n/ac, after evaluating, beamforming mode has been evaluated to be the worst case, so it was selected to test and record in this test report.

The following test modes were performed for all tests:

**For Conducted Emission test:**

Mode 1. Normal Link

**For Radiated Emission below 1GHz test:**

Mode 1. Normal Link

**For Radiated Emission above 1GHz test:**

Mode 1. CTX

**For Radiated Emission Co-location Test:**

Mode 1. EUT- 2.4G WLAN + Bluetooth

Mode 2. EUT- 5G WLAN + Bluetooth

**For Co-location MPE:**

The EUT could be applied with 2.4GHz WLAN+Bluetooth function and 5GHz WLAN+Bluetooth function therefore; Co-location Maximum Permissible Exposure (Please refer to FA422118-06) and Radiated Emission Co-location (please refer to Appendix B) tests are added for simultaneously transmit among 2.4GHz WLAN+Bluetooth function and 5GHz WLAN+Bluetooth 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 Reg. No. | IC File No. | VCCI Reg. No |
| 03CH01-CB          | SAC  | Hsin Chu | 262045       | IC 4086D    | -            |
| CO01-CB            | Conduction   | Hsin Chu | 262045       | 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: FR422118AA

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

1.

| Report No. / Detail | Gist                                    | Modifications   |
|---------------------|---|---|
| FR422118-06AC       | The total antennas amounted to 27 sets. | <p>There is no hardware or electrical modification made to the applying modular transmitter itself.</p> <p>Adding 26 sets of PIFA antenna with lower gain than the original Certificate, after evaluating, it is not necessary to re-test all test items.</p> <p>Please refer to the Appendix C for detail.</p> |

2.

| Modifications  | Performance Checking  |
|--|---|
| Changing 5GHz Band 2 and Band 3 to "New Rules" from "Old Rules". | It is not necessary to re-test all test items.  |
| Changing 5GHz Band 4 to "New Rules" from "Old Rules".            | <ol style="list-style-type: none"> <li>1. 26dB Bandwidth and 99% Occupied Bandwidth</li> <li>2. 6dB Spectrum Bandwidth</li> <li>3. Maximum Conducted Output Power</li> <li>4. Power Spectral Density</li> <li>5. Radiated Emissions (Above 1GHz)</li> <li>6. Band Edge Emissions</li> <li>7. Frequency Stability</li> </ol> |

Note: Test results of AC Power Line Conducted Emissions Measurement and Radiated Emissions below 1GHz are based on original report FR422118AA.

### 3.8. Table for Supporting Units

For Test Site No: CO01-CB

| Support Unit   | Brand      | Model        | FCC ID           |
|----------------|------------|--------------|------------------|
| Notebook*2     | DELL       | E6430        | DoC              |
| AP Router      | Planex     | GW-AP54SGX   | KA220030603014-1 |
| Mouse          | Logitech   | M-U0026      | DoC              |
| Earphone       | SHYARO CHI | MIC-04       | N/A              |
| Device         | REALTEK    | RTL8812AENF  | TX2RTL8812AENF   |
| Test Fixture*2 | Realtek    | NGFF Adapter | N/A              |

For Test Site No: TH01-CB

| Support Unit | Brand   | Model        | FCC ID |
|--------------|---------|--------------|--------|
| Notebook     | DELL    | E4300        | DoC    |
| Test Fixture | Realtek | NGFF Adapter | N/A    |

For Test Site No: 03CH01-CB <Above 1GHz test / For non-beamforming mode>

| Support Unit | Brand   | Model        | FCC ID |
|--------------|---------|--------------|--------|
| Notebook     | DELL    | E4300        | DoC    |
| Test Fixture | Realtek | NGFF Adapter | N/A    |

For Test Site No: 03CH01-CB <Above 1GHz test / For beamforming mode>

| Support Unit | Brand   | Model        | FCC ID           |
|--------------|---------|--------------|------------------|
| Notebook     | DELL    | E4300        | DoC              |
| Notebook     | DELL    | E4300        | DoC              |
| Wireless AP  | Realtek | GW-AP54SGX   | KA220030603014-1 |
| Test Fixture | Realtek | NGFF Adapter | N/A              |

### 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    | Realtek 11ac 8812A PCIE WLAN MP Diagnostic Program<br>0.0057.02.20140110 |          |          |
|--------------------------|--|----------|----------|
| Mode                     | Test Frequency (MHz)   |          |          |
|                          | NCB: 20MHz   |          |          |
|                          | 5745 MHz   | 5785 MHz | 5825 MHz |
| 802.11a / 1TX            | 45   | 45       | 45       |
| 802.11a / 2TX            | 45/47  | 47/51    | 44/50    |
| 802.11ac MCS0/Nss1 VHT20 | 40/43  | 49/51    | 44/49    |
| Mode                     | NCB: 40MHz   |          |          |
| 802.11ac MCS0/Nss1 VHT40 | 5755 MHz   | 5795 MHz |          |
|                          | 41/42  | 47/52    |          |
| Mode                     | NCB: 80MHz   |          |          |
| 802.11ac MCS0/Nss1 VHT80 | 5775 MHz   |          |          |
|                          | 38/39  |          |          |

### 3.10. EUT Operation during Test

For non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

For Conducted Mode:

The EUT was programmed to be in continuously transmitting mode.

For Radiated Mode:

During the test, the following programs under WIN XP were executed.

The program was executed as follows:

1. During the test, the EUT operation to normal function.
2. Executed command fixed test channel under DOS.
3. Executed "Lantest.exe " to link with the remote workstation to receive and transmit packet by Wireless AP and transmit duty cycle no less 98%

### 3.11. Duty Cycle

For non-beamforming mode:

| Mode    | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|---------|--------------|------------------|----------------|------------------|-----------------------|
| 802.11a | 1.000        | 1.000            | 100.00%        | 0.00             | 0.01                  |

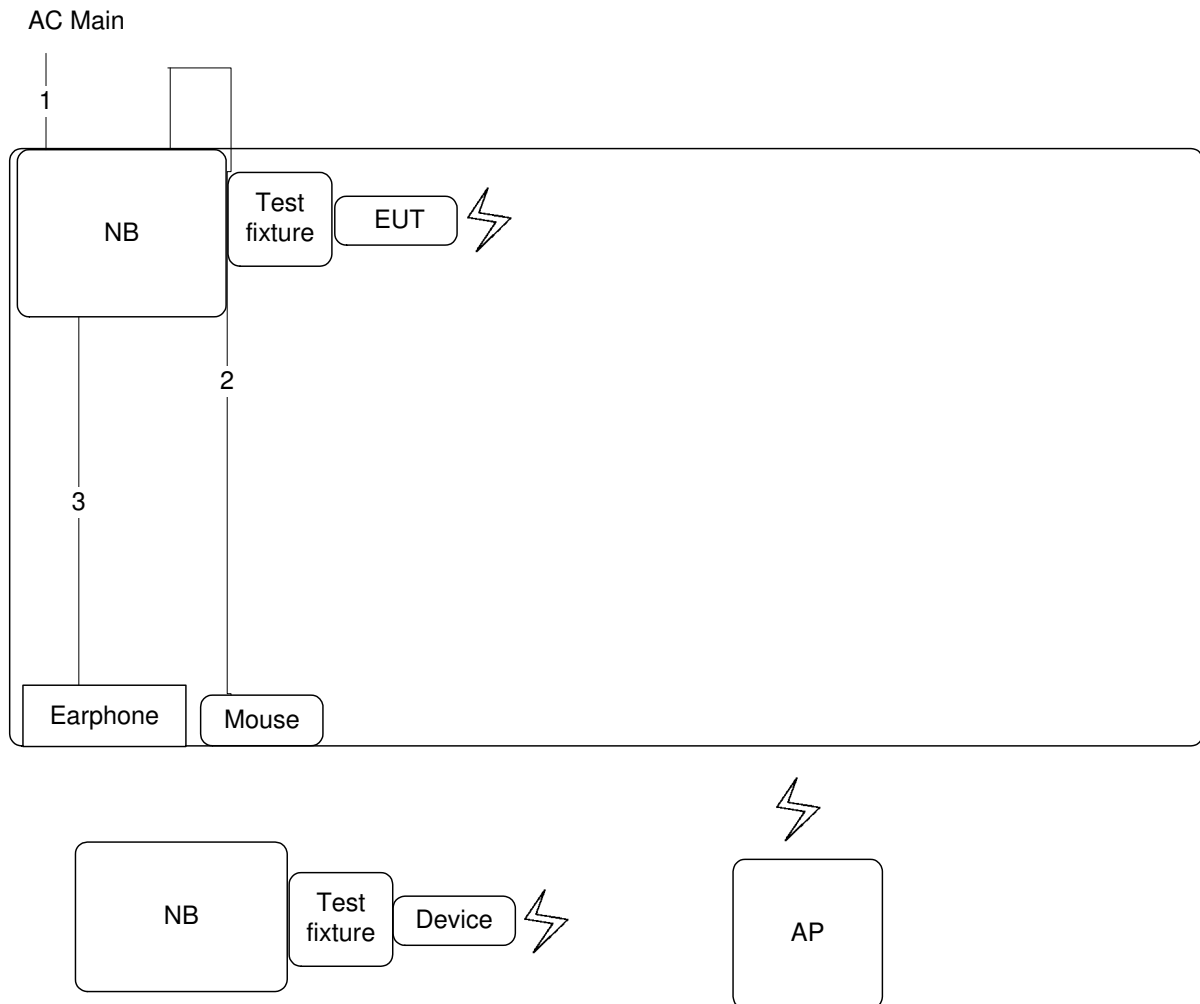
For beamforming mode:

| Mode                     | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|--------------------------|--------------|------------------|----------------|------------------|-----------------------|
| 802.11ac MCS0/Nss1 VHT20 | 1.939        | 2.075            | 93.44%         | 0.29             | 0.52                  |
| 802.11ac MCS0/Nss1 VHT40 | 0.958        | 1.067            | 89.79%         | 0.47             | 1.04                  |
| 802.11ac MCS0/Nss1 VHT80 | 0.862        | 0.994            | 86.77%         | 0.62             | 1.16                  |



### 3.12. Test Configurations

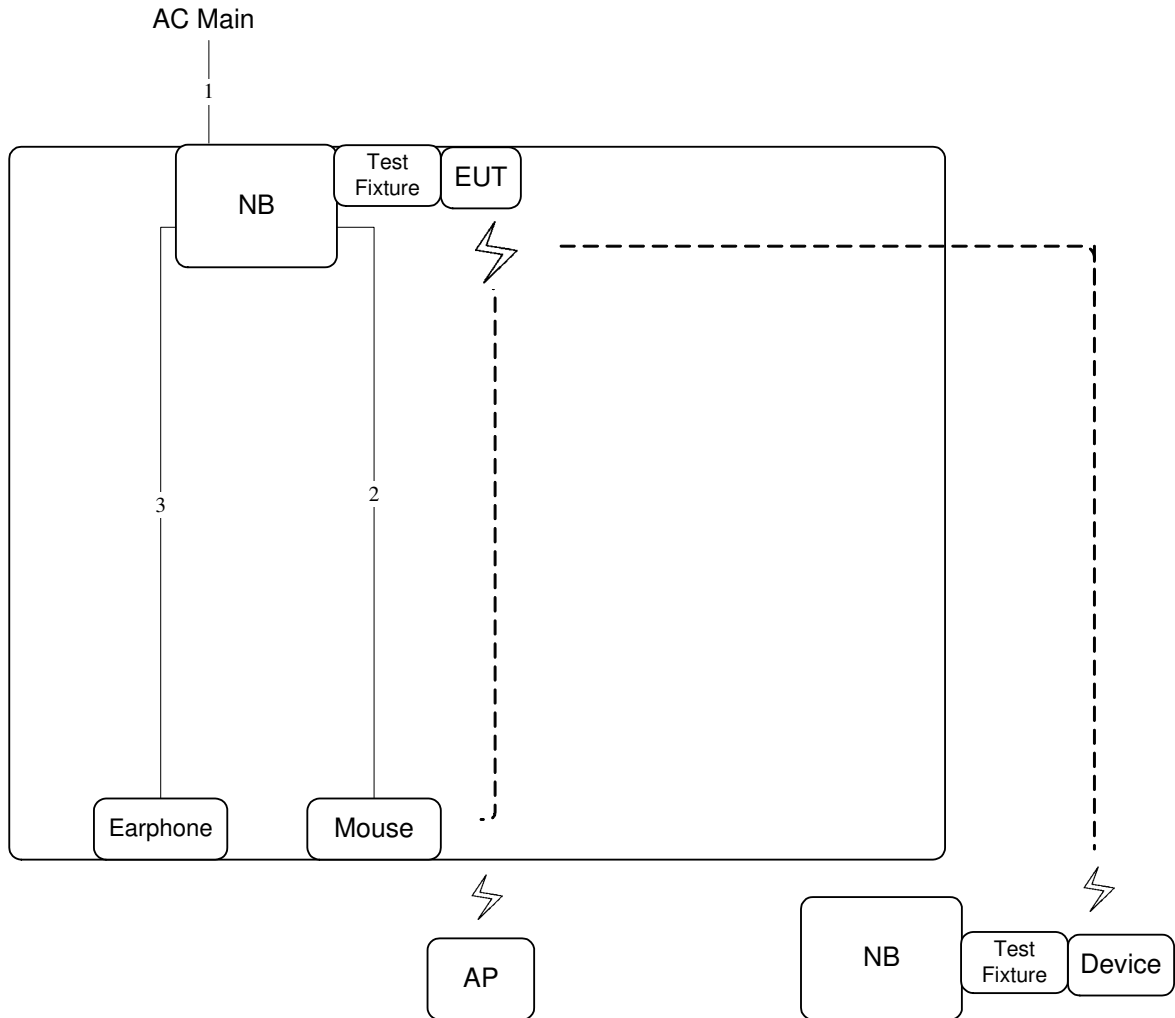
#### 3.12.1. AC Power Line Conduction Emissions Test Configuration



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 2.6m   |
| 2    | USB cable   | Yes      | 1.8m   |
| 3    | Audio cable | No       | 1.5m   |

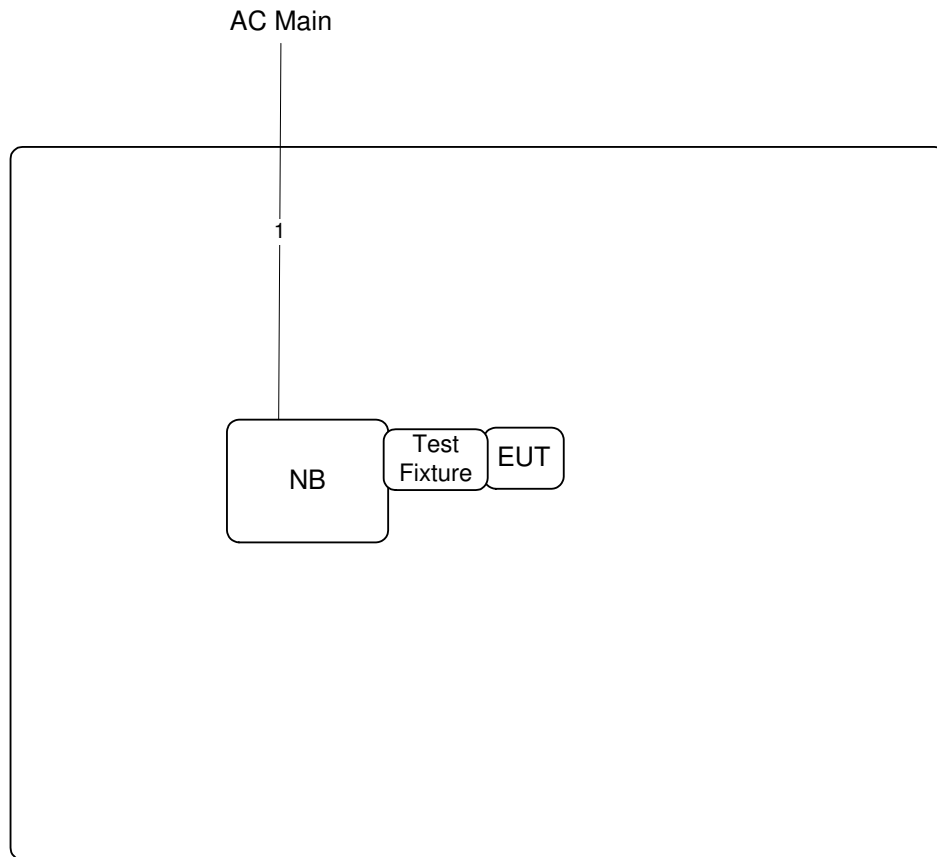
### 3.12.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz ~1GHz



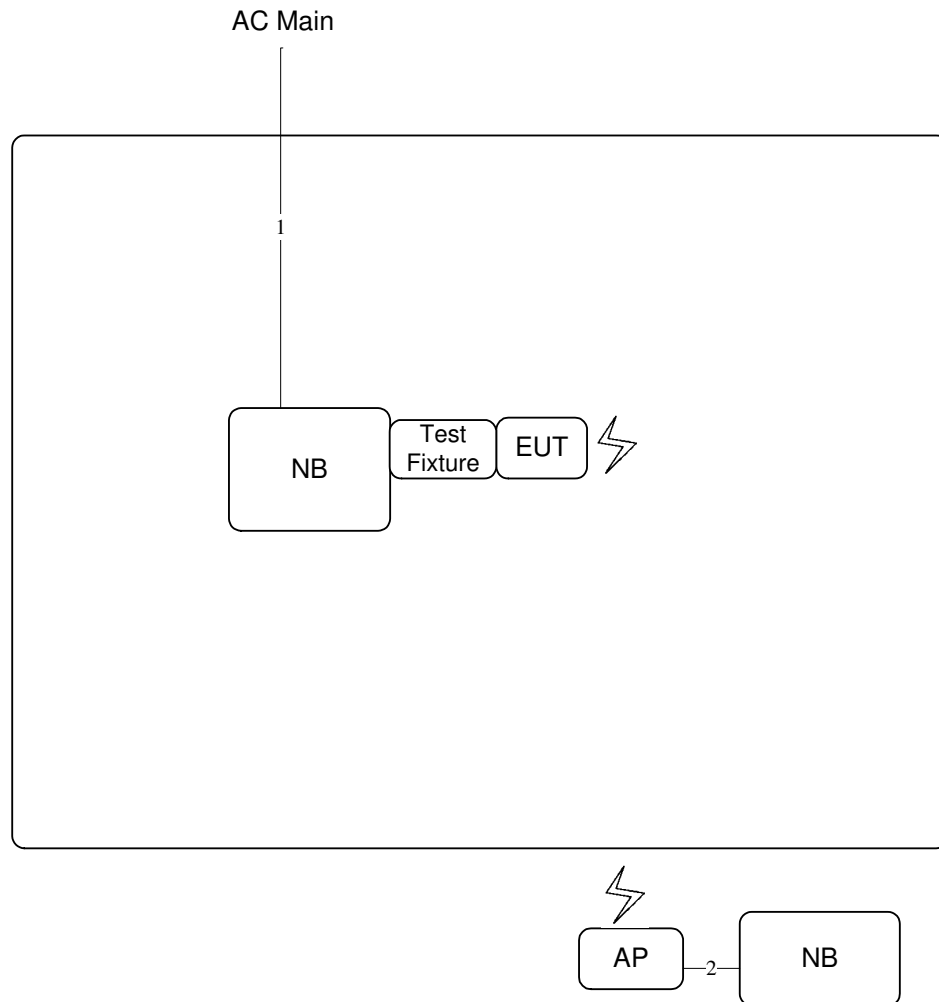
| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 2.6m   |
| 2    | USB cable   | Yes      | 1.8m   |
| 3    | Audio cable | No       | 1.5m   |

Test Configuration: above 1GHz  
 For non-beamforming mode



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 2.6m   |

For beamforming mode



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power cable | No       | 2.6m   |
| 2    | RJ-45 cable | No       | 1.5m   |

## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product that is designed to connect to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

| Frequency (MHz) | QP Limit (dBuV) | AV Limit (dBuV) |
|-----------------|-----------------|-----------------|
| 0.15~0.5        | 66~56           | 56~46           |
| 0.5~5           | 56              | 46              |
| 5~30            | 60              | 50              |

#### 4.1.2. Measuring Instruments and Setting

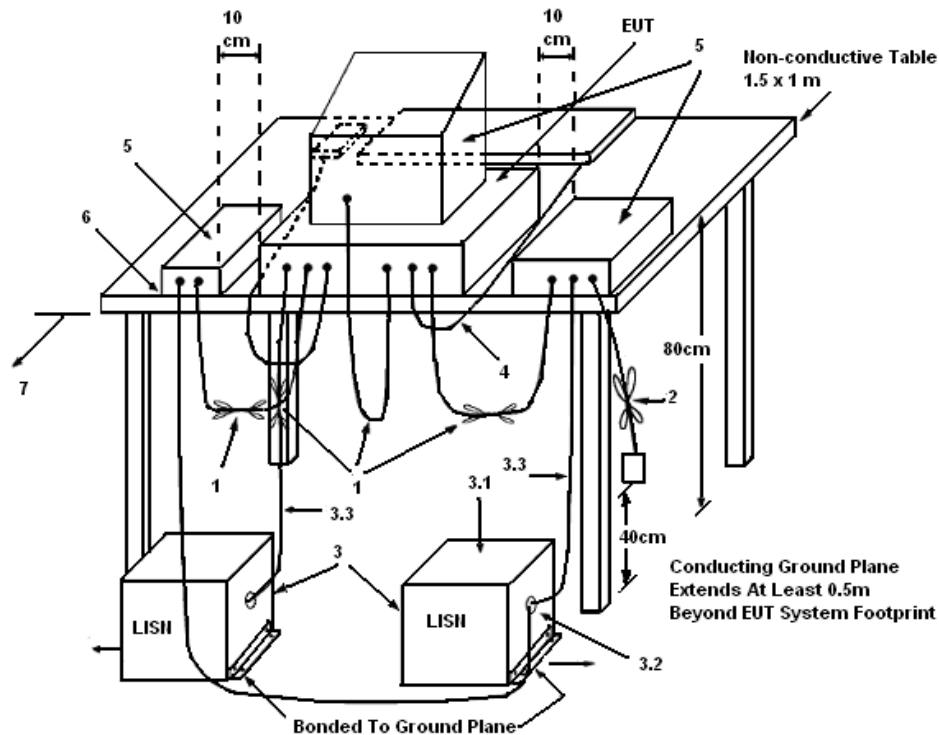
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

#### 4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

#### 4.1.4. Test Setup Layout



#### LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

#### 4.1.5. Test Deviation

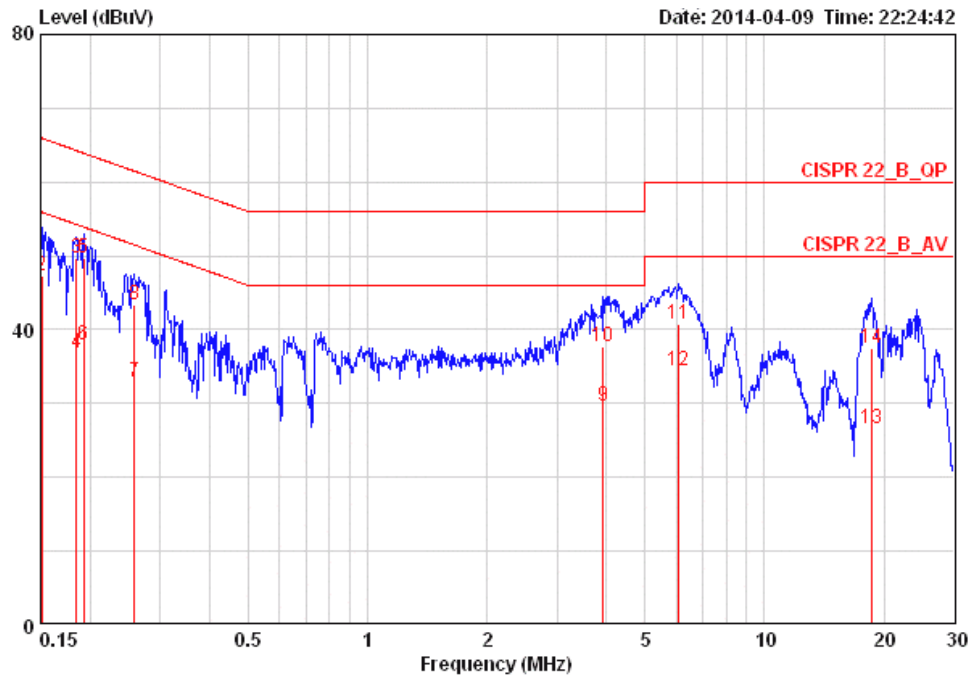
There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

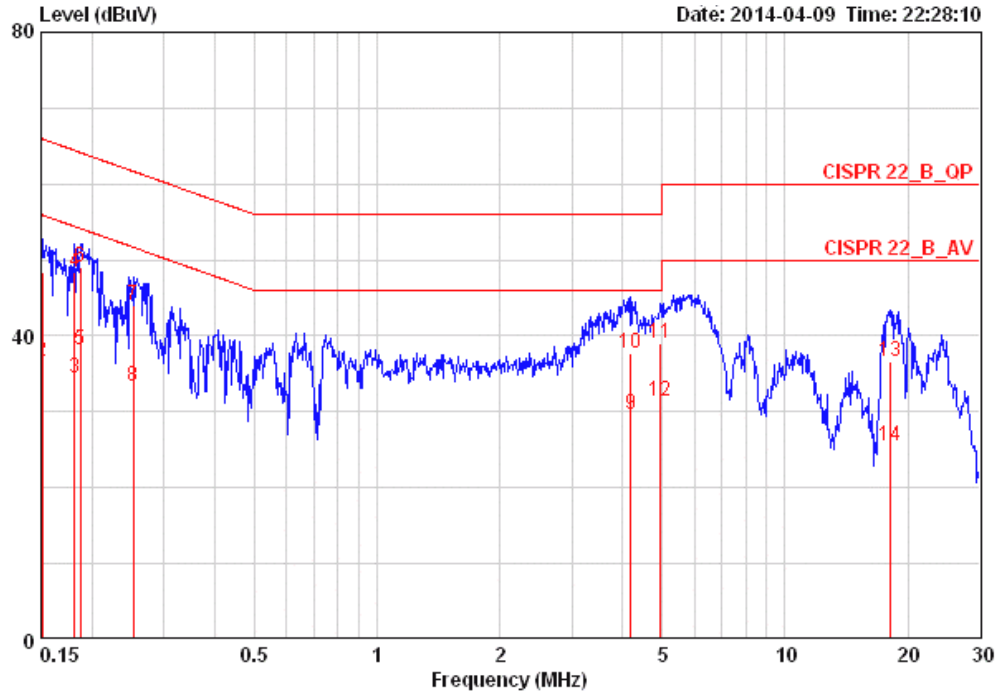
4.1.7. Results of AC Power Line Conducted Emissions Measurement

|               |             |          |      |
|---------------|-------------|----------|------|
| Temperature   | 25°C        | Humidity | 52%  |
| Test Engineer | Parody Lin  | Phase    | Line |
| Configuration | Normal Link |          |      |



|    | Freq    | Level | Over Limit | Limit Line | LISN Factor | Read Level | Cable Loss | Pol/Phase | Remark  |
|----|---------|-------|------------|------------|-------------|------------|------------|-----------|---------|
|    | MHz     | dBuV  | dB         | dBuV       | dB          | dBuV       | dB         |           |         |
| 1  | 0.15080 | 34.93 | -21.03     | 55.96      | 0.15        | 34.60      | 0.18       | LINE      | AVERAGE |
| 2  | 0.15080 | 47.41 | -18.55     | 65.96      | 0.15        | 47.08      | 0.18       | LINE      | QP      |
| 3  | 0.18443 | 49.79 | -14.49     | 64.28      | 0.15        | 49.45      | 0.19       | LINE      | QP      |
| 4  | 0.18443 | 36.73 | -17.55     | 54.28      | 0.15        | 36.39      | 0.19       | LINE      | AVERAGE |
| 5  | 0.19242 | 49.64 | -14.29     | 63.93      | 0.15        | 49.29      | 0.20       | LINE      | QP      |
| 6  | 0.19242 | 37.91 | -16.02     | 53.93      | 0.15        | 37.56      | 0.20       | LINE      | AVERAGE |
| 7  | 0.25888 | 32.88 | -18.59     | 51.47      | 0.15        | 32.53      | 0.20       | LINE      | AVERAGE |
| 8  | 0.25888 | 43.47 | -18.00     | 61.47      | 0.15        | 43.12      | 0.20       | LINE      | QP      |
| 9  | 3.922   | 29.68 | -16.32     | 46.00      | 0.28        | 29.11      | 0.30       | LINE      | AVERAGE |
| 10 | 3.922   | 37.68 | -18.32     | 56.00      | 0.28        | 37.11      | 0.30       | LINE      | QP      |
| 11 | 6.056   | 40.86 | -19.14     | 60.00      | 0.31        | 40.22      | 0.33       | LINE      | QP      |
| 12 | 6.056   | 34.40 | -15.60     | 50.00      | 0.31        | 33.76      | 0.33       | LINE      | AVERAGE |
| 13 | 18.622  | 26.57 | -23.43     | 50.00      | 0.57        | 25.51      | 0.49       | LINE      | AVERAGE |
| 14 | 18.622  | 37.44 | -22.56     | 60.00      | 0.57        | 36.38      | 0.49       | LINE      | QP      |

|               |             |          |         |
|---------------|-------------|----------|---------|
| Temperature   | 25°C        | Humidity | 52%     |
| Test Engineer | Parody Lin  | Phase    | Neutral |
| Configuration | Normal Link |          |         |



|    | Freq    | Level | Over   | Limit | LISN   | Read  | Cable |           |         |
|----|---------|-------|--------|-------|--------|-------|-------|-----------|---------|
|    | MHz     | dBuV  | Limit  | Line  | Factor | Level | Loss  | Pol/Phase | Remark  |
|    |         |       | dB     | dBuV  | dB     | dBuV  | dB    |           |         |
| 1  | 0.15080 | 48.43 | -17.53 | 65.96 | 0.07   | 48.18 | 0.18  | NEUTRAL   | QP      |
| 2  | 0.15080 | 36.52 | -19.44 | 55.96 | 0.07   | 36.27 | 0.18  | NEUTRAL   | AVERAGE |
| 3  | 0.18152 | 34.34 | -20.07 | 54.42 | 0.07   | 34.08 | 0.19  | NEUTRAL   | AVERAGE |
| 4  | 0.18152 | 48.39 | -16.02 | 64.42 | 0.07   | 48.13 | 0.19  | NEUTRAL   | QP      |
| 5  | 0.18739 | 38.26 | -15.90 | 54.15 | 0.07   | 37.99 | 0.20  | NEUTRAL   | AVERAGE |
| 6  | 0.18739 | 48.98 | -15.18 | 64.15 | 0.07   | 48.71 | 0.20  | NEUTRAL   | QP      |
| 7  | 0.25211 | 44.06 | -17.63 | 61.69 | 0.07   | 43.79 | 0.20  | NEUTRAL   | QP      |
| 8  | 0.25211 | 33.45 | -18.24 | 51.69 | 0.07   | 33.18 | 0.20  | NEUTRAL   | AVERAGE |
| 9  | 4.180   | 29.73 | -16.27 | 46.00 | 0.13   | 29.29 | 0.30  | NEUTRAL   | AVERAGE |
| 10 | 4.180   | 37.82 | -18.18 | 56.00 | 0.13   | 37.38 | 0.30  | NEUTRAL   | QP      |
| 11 | 4.952   | 38.97 | -17.03 | 56.00 | 0.15   | 38.50 | 0.32  | NEUTRAL   | QP      |
| 12 | 4.952   | 31.34 | -14.66 | 46.00 | 0.15   | 30.87 | 0.32  | NEUTRAL   | AVERAGE |
| 13 | 18.039  | 36.63 | -23.37 | 60.00 | 0.41   | 35.73 | 0.48  | NEUTRAL   | QP      |
| 14 | 18.039  | 25.46 | -24.54 | 50.00 | 0.41   | 24.56 | 0.48  | NEUTRAL   | AVERAGE |

Note:

Level = Read Level + LISN Factor + Cable Loss.



## 4.2. 26dB Bandwidth and 99% Occupied Bandwidth Measurement

### 4.2.1. Limit

No restriction limits.

### 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 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                                   |

### 4.2.3. 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%.

### 4.2.4. Test Setup Layout

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

This test setup layout is the same as that shown in section 4.6.4.

### 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 26dB Bandwidth and 99% Occupied Bandwidth

|               |              |          |     |
|---------------|--------------|----------|-----|
| Temperature   | 24°C         | Humidity | 60% |
| Test Engineer | Clemens Fang |          |     |

<For non-beamforming mode>

For 1TX: Chain 1

| Mode    | Frequency | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---------|-----------|----------------------|------------------------------|
| 802.11a | 5745 MHz  | 24.17                | 16.93                        |
|         | 5785 MHz  | 25.39                | 17.11                        |
|         | 5825 MHz  | 25.22                | 16.93                        |

For 2TX: Chain 1 + Chain 2

| Mode    | Frequency | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|---------|-----------|----------------------|------------------------------|
| 802.11a | 5745 MHz  | 25.30                | 17.63                        |
|         | 5785 MHz  | 27.13                | 18.58                        |
|         | 5825 MHz  | 26.09                | 17.71                        |

<For beamforming mode>

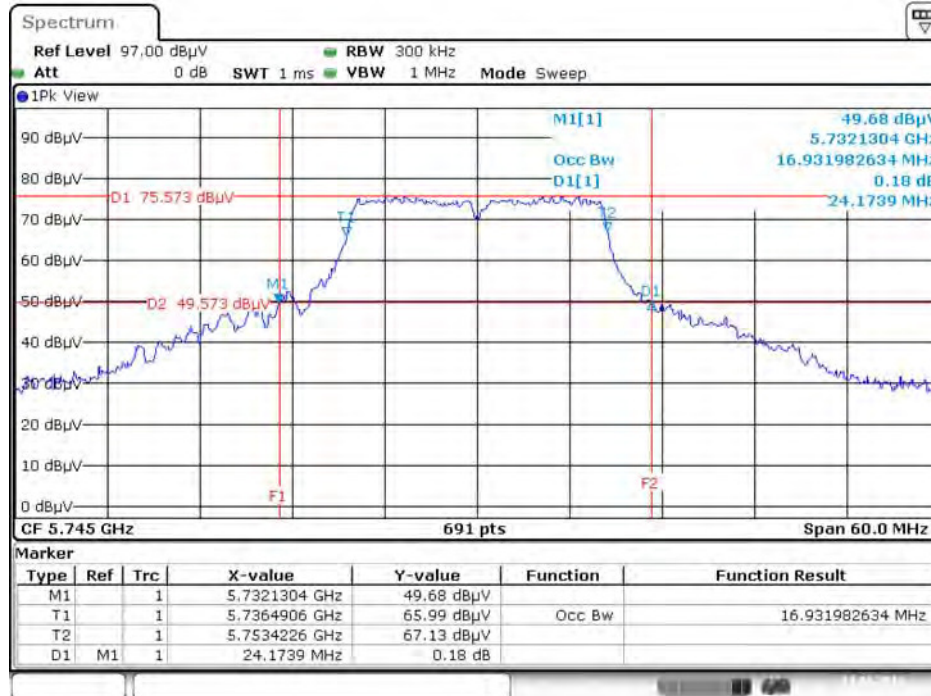
For 2TX: Chain 1 + Chain 2

| Mode                        | Frequency | 26dB Bandwidth (MHz) | 99% Occupied Bandwidth (MHz) |
|-----------------------------|-----------|----------------------|------------------------------|
| 802.11ac<br>MCS0/Nss1 VHT20 | 5745 MHz  | 21.57                | 17.89                        |
|                             | 5785 MHz  | 34.00                | 18.49                        |
|                             | 5825 MHz  | 22.09                | 17.97                        |
| 802.11ac<br>MCS0/Nss1 VHT40 | 5755 MHz  | 45.07                | 37.19                        |
|                             | 5795 MHz  | 71.88                | 37.77                        |
| 802.11ac<br>MCS0/Nss1 VHT80 | 5775 MHz  | 82.90                | 75.54                        |

<For non-beamforming mode>

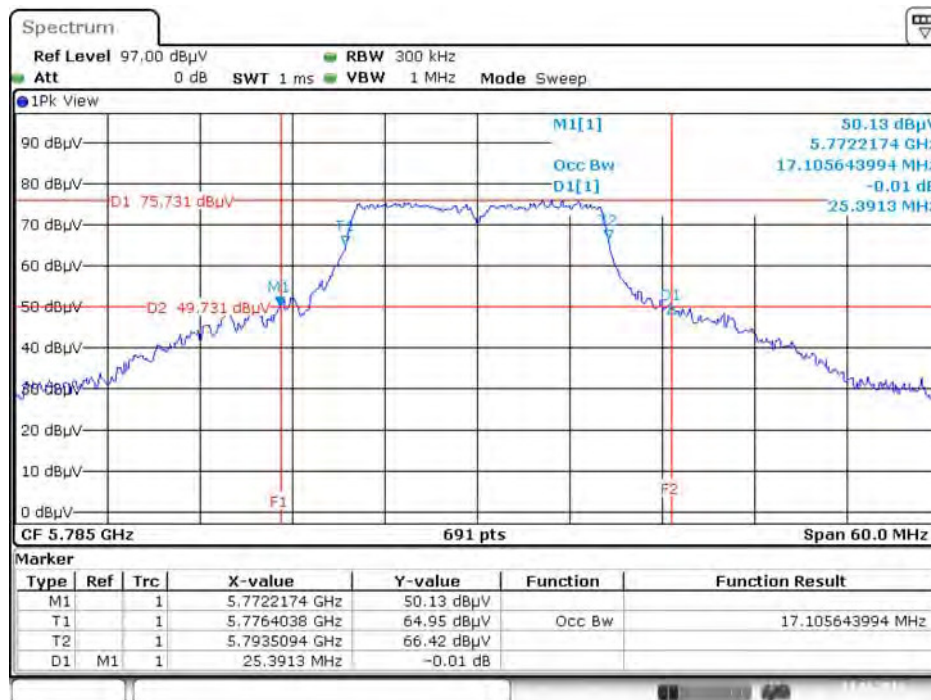
For 1TX:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5745 MHz



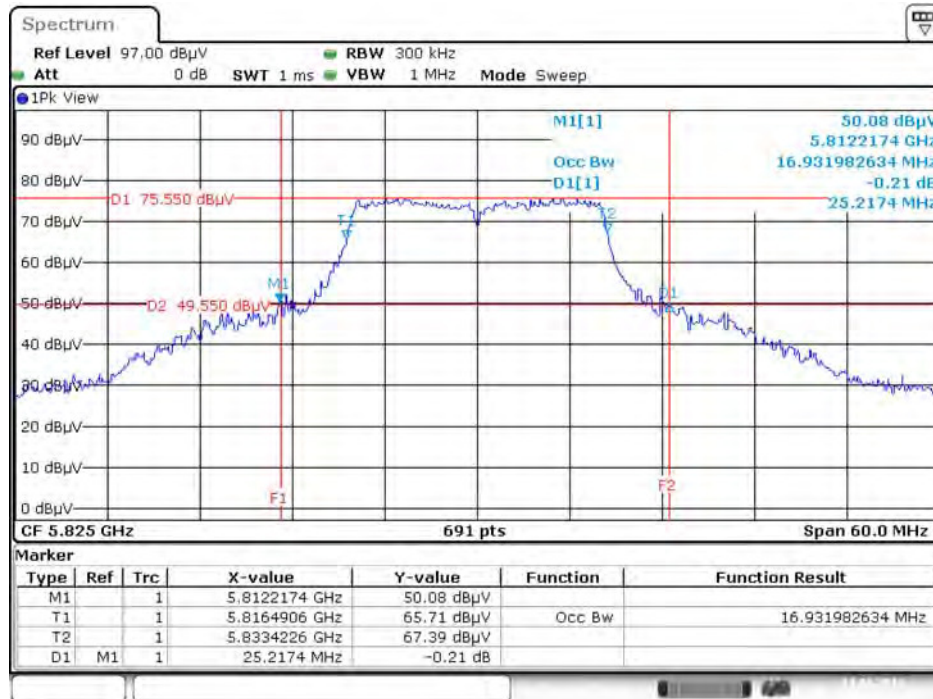
Date: 13.JAN.2016 23:26:56

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5785 MHz



Date: 13.JAN.2016 23:27:15

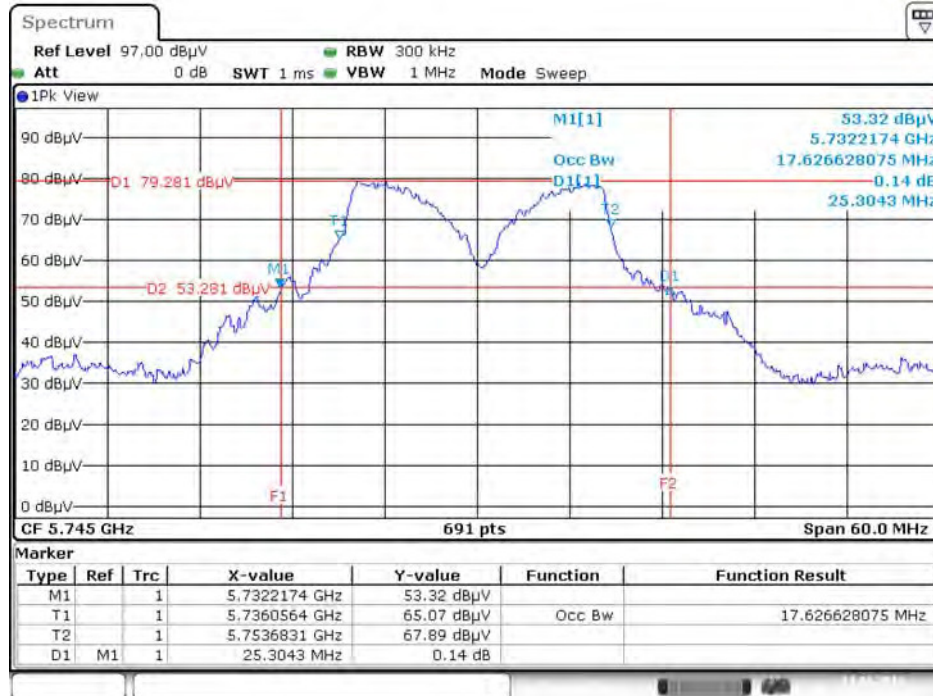
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5825 MHz



Date: 13.JAN.2016 23:27:38

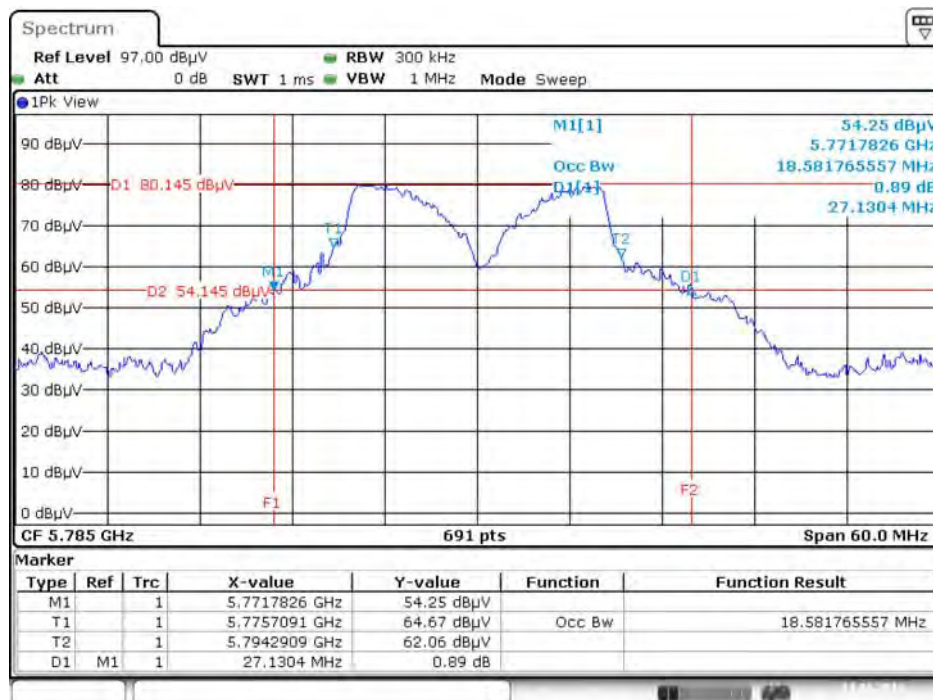
For 2TX:

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5745 MHz



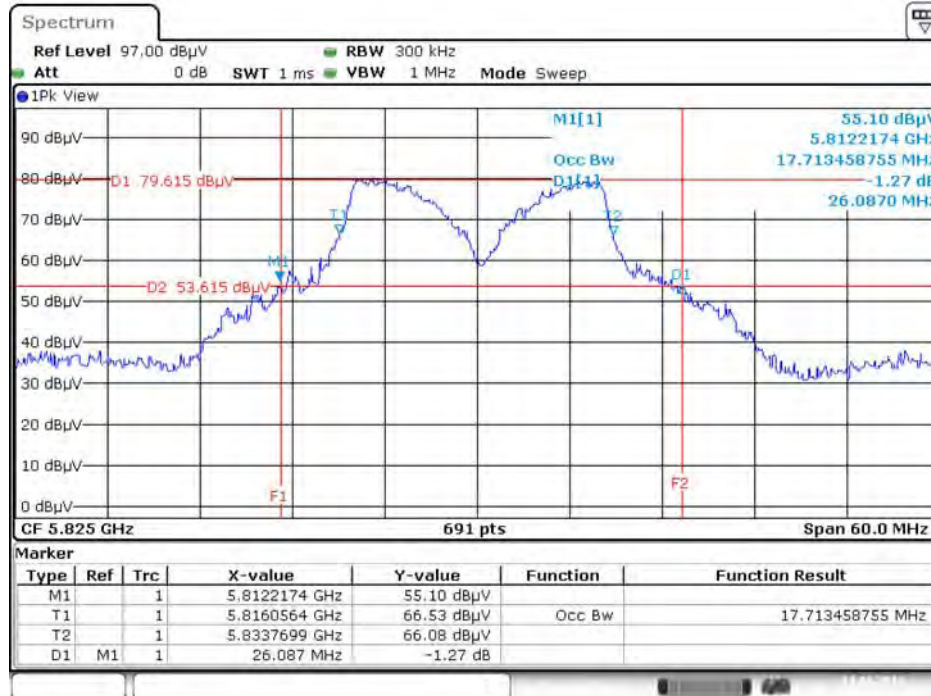
Date: 13.JAN.2016 23:24:49

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



Date: 13.JAN.2016 23:25:12

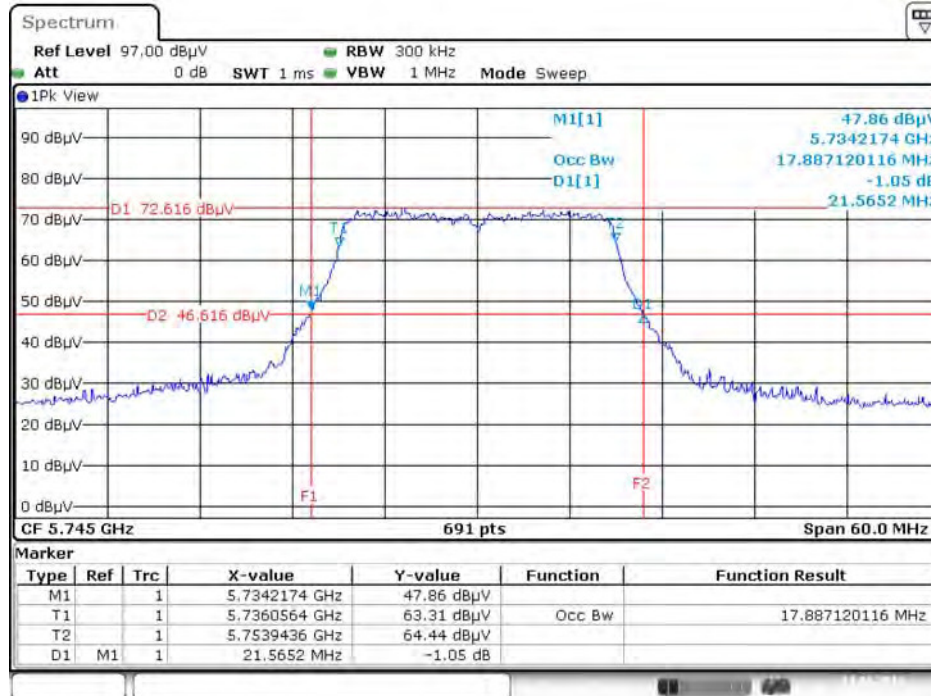
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5825 MHz



Date: 13.JAN.2016 23:25:44

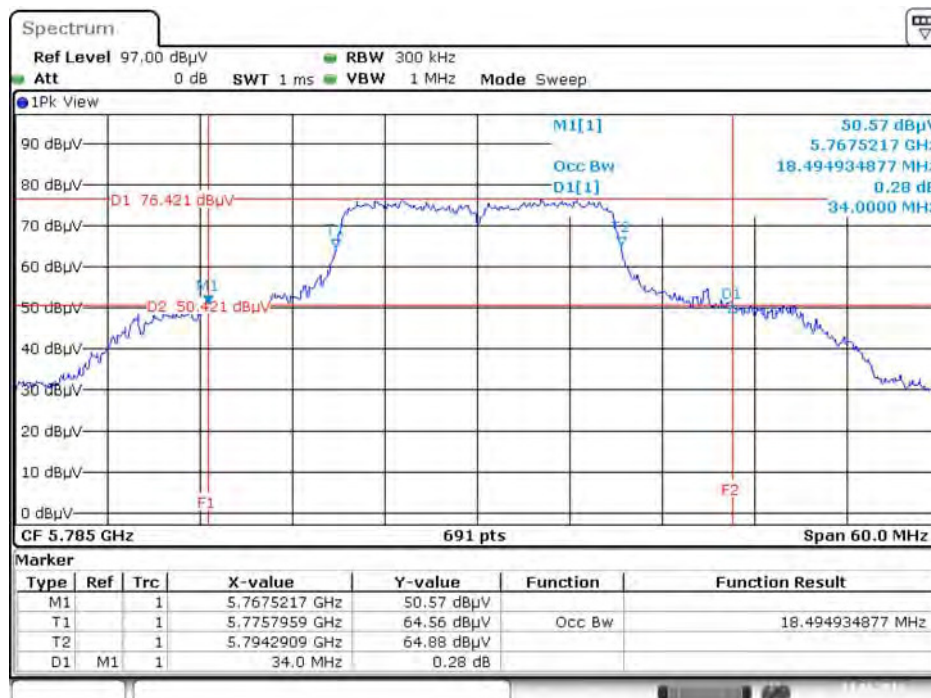
<For beamforming mode>

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5745 MHz



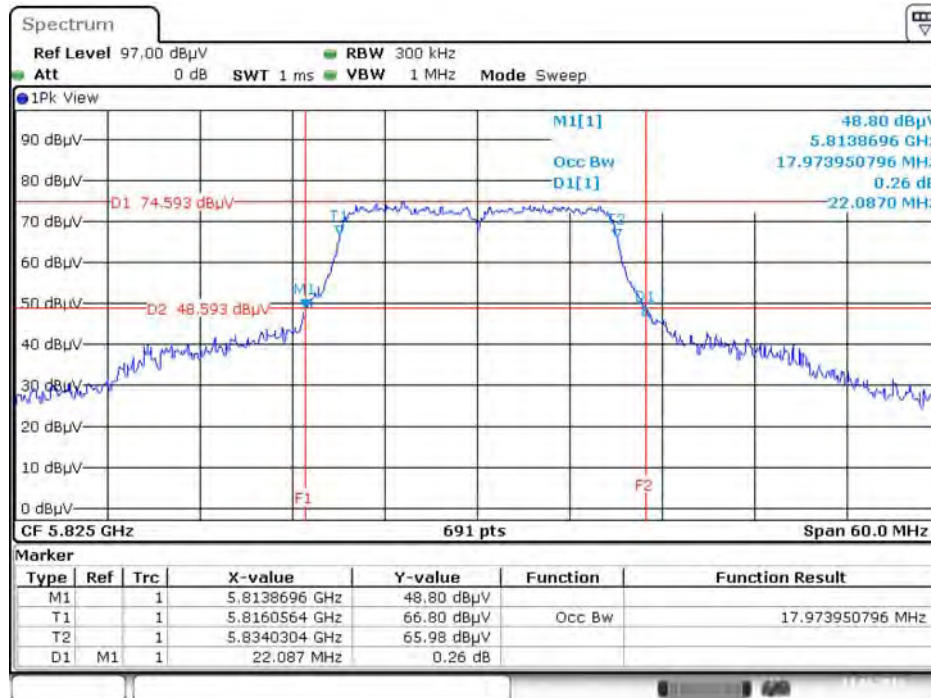
Date: 13.JAN.2016 23:09:12

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



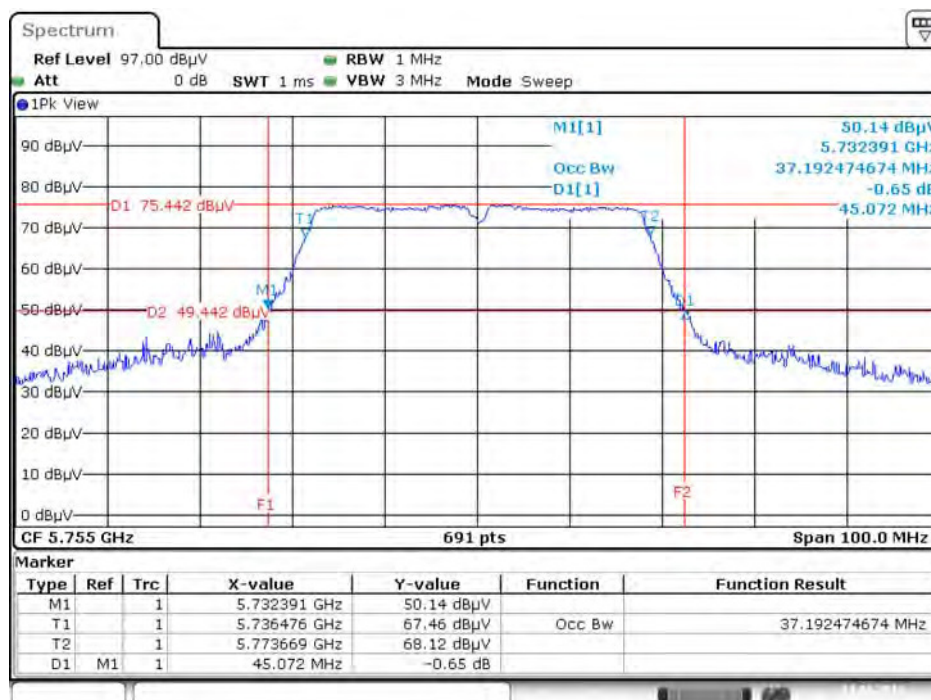
Date: 13.JAN.2016 23:07:45

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5825 MHz



Date: 13.JAN.2016 23:07:06

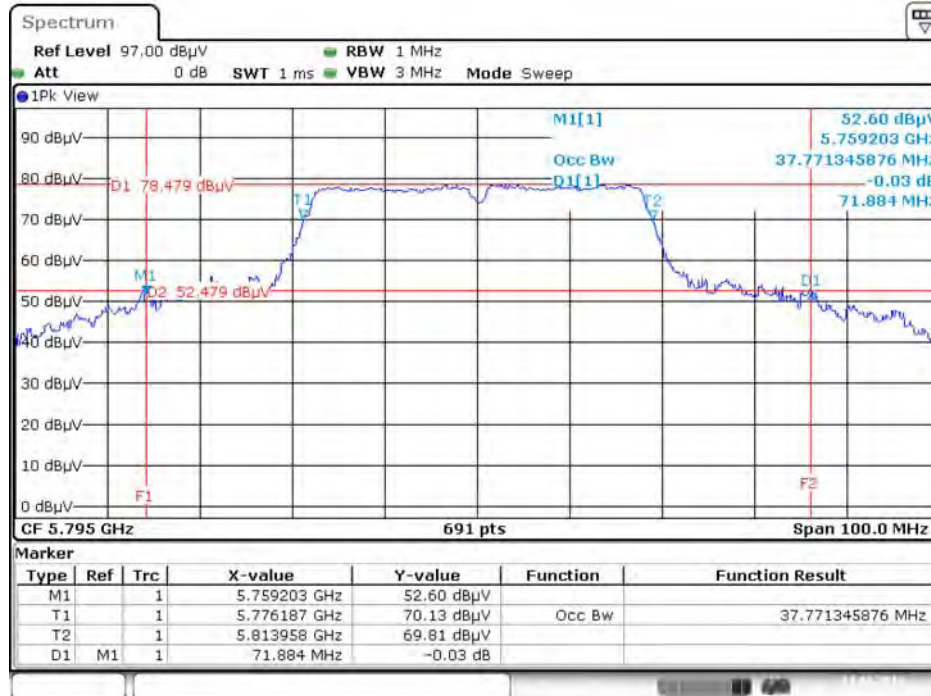
26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5755 MHz



Date: 13.JAN.2016 23:10:36

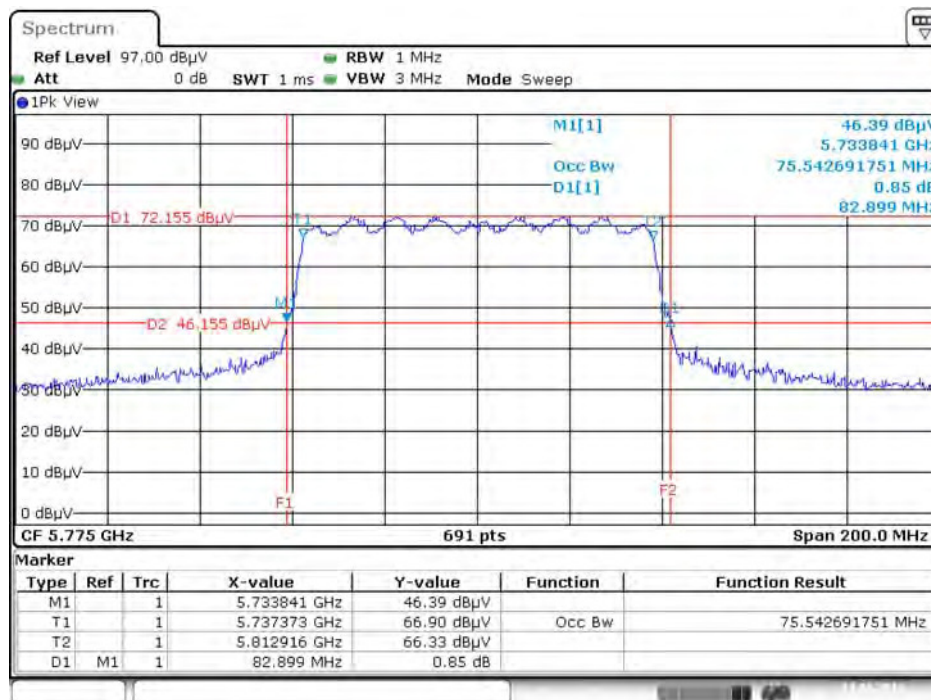


26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5795 MHz



Date: 13.JAN.2016 23:11:04

26dB Bandwidth and 99% Occupied Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



Date: 13.JAN.2016 23:12:42

### 4.3. 6dB Spectrum Bandwidth Measurement

#### 4.3.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

#### 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 spectrum analyzer.

| 6dB Spectrum Bandwidth |                            |
|------------------------|----------------------------|
| Spectrum Parameters    | Setting                    |
| Attenuation            | Auto                       |
| Span Frequency         | > 6dB Bandwidth            |
| RBW                    | 100kHz                     |
| VBW                    | $\geq 3 \times \text{RBW}$ |
| Detector               | Peak                       |
| Trace                  | Max Hold                   |
| Sweep Time             | Auto                       |

#### 4.3.3. Test Procedures

For Radiated 6dB Bandwidth Measurement:

1. The transmitter was radiated to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB789033 D02 v01r01 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - section (C) Emission Bandwidth.
3. Multiple antenna system was performed in accordance with KDB662911 D01 v02r01 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measured the spectrum width with power higher than 6dB below carrier.

#### 4.3.4. Test Setup Layout

For Radiated 6dB Bandwidth Measurement:

This test setup layout is the same as that shown in section 4.6.4.

#### 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 6dB Spectrum Bandwidth

|                      |              |                 |     |
|----------------------|--------------|-----------------|-----|
| <b>Temperature</b>   | 24°C         | <b>Humidity</b> | 60% |
| <b>Test Engineer</b> | Clemens Fang |                 |     |

<For non-beamforming mode>

For 1TX: Chain 1

| Mode    | Frequency | 6dB Bandwidth (MHz) | Min. Limit (kHz) | Test Result |
|---------|-----------|---------------------|------------------|-------------|
| 802.11a | 5745 MHz  | 16.58               | 500              | Complies    |
|         | 5785 MHz  | 16.52               | 500              | Complies    |
|         | 5825 MHz  | 16.58               | 500              | Complies    |

For 2TX: Chain 1+Chain2

| Mode    | Frequency | 6dB Bandwidth (MHz) | Min. Limit (kHz) | Test Result |
|---------|-----------|---------------------|------------------|-------------|
| 802.11a | 5745 MHz  | 16.58               | 500              | Complies    |
|         | 5785 MHz  | 16.58               | 500              | Complies    |
|         | 5825 MHz  | 16.58               | 500              | Complies    |

<For beamforming mode>

For 2TX: Chain 1+Chain2

| Mode                           | Frequency | 6dB Bandwidth (MHz) | Min. Limit (kHz) | Test Result |
|--------------------------------|-----------|---------------------|------------------|-------------|
| 802.11ac<br>MCS0/Nss1<br>VHT20 | 5745 MHz  | 17.68               | 500              | Complies    |
|                                | 5785 MHz  | 17.68               | 500              | Complies    |
|                                | 5825 MHz  | 17.74               | 500              | Complies    |
| 802.11ac<br>MCS0/Nss1<br>VHT40 | 5755 MHz  | 45.07               | 500              | Complies    |
|                                | 5795 MHz  | 71.88               | 500              | Complies    |
| 802.11ac<br>MCS0/Nss1<br>VHT80 | 5775 MHz  | 76.52               | 500              | Complies    |

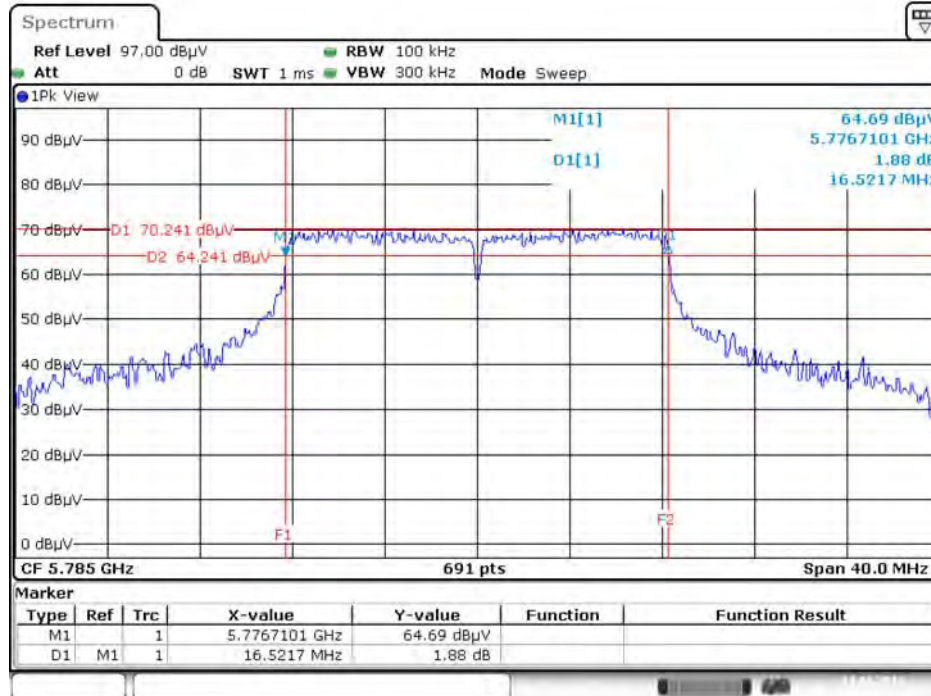
Note: All the test values were listed in the report.

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

<For non-beamforming mode>

For 1TX:

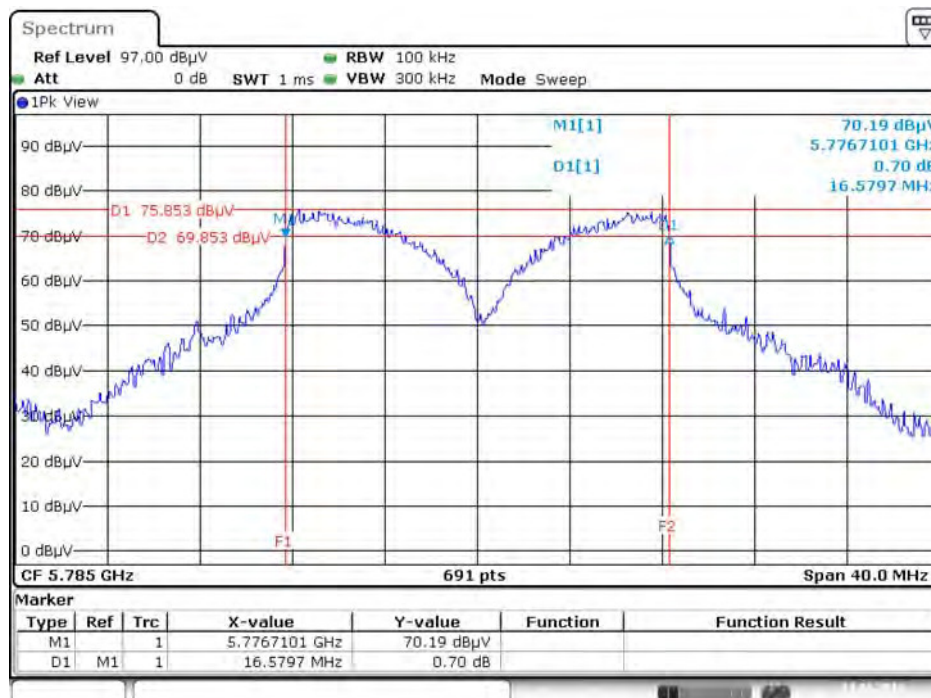
6 dB Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 / 5785 MHz



Date: 13.JAN.2016 23:29:54

For 2TX:

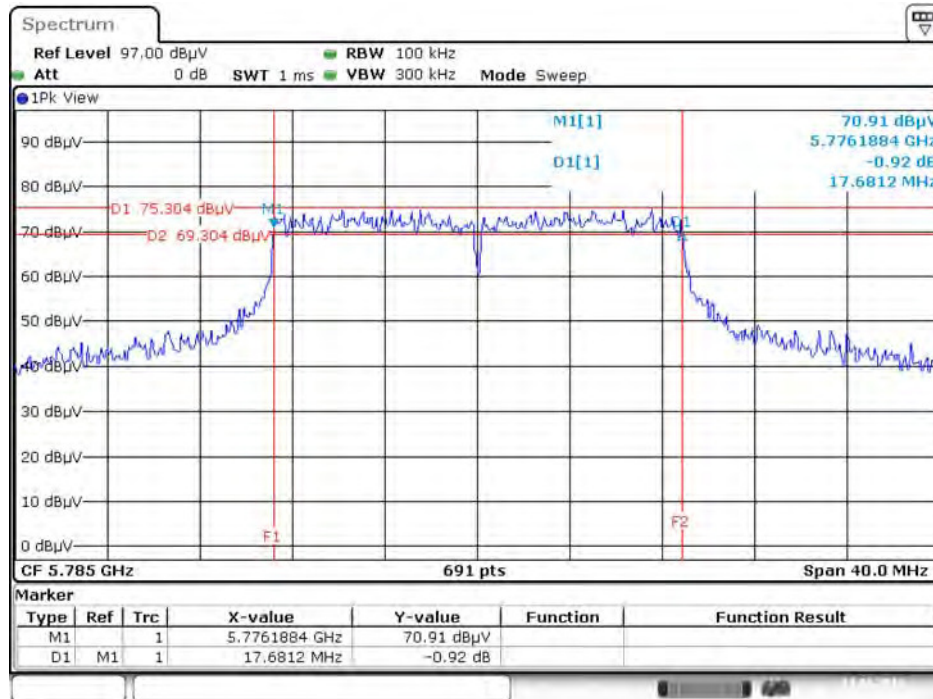
6 dB Bandwidth Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



Date: 13.JAN.2016 23:31:08

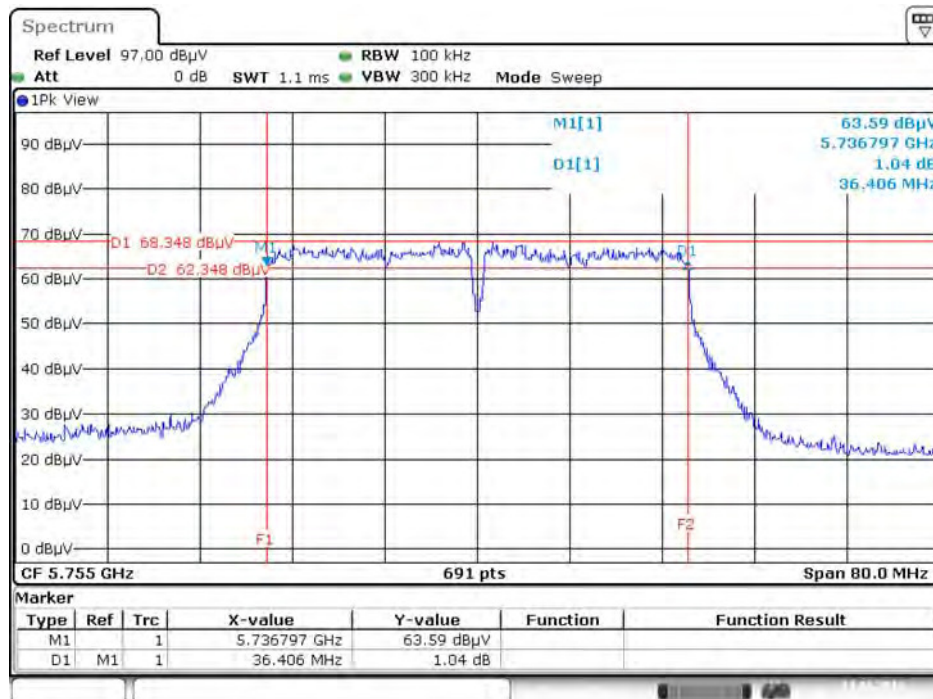
<For beamforming mode>

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz



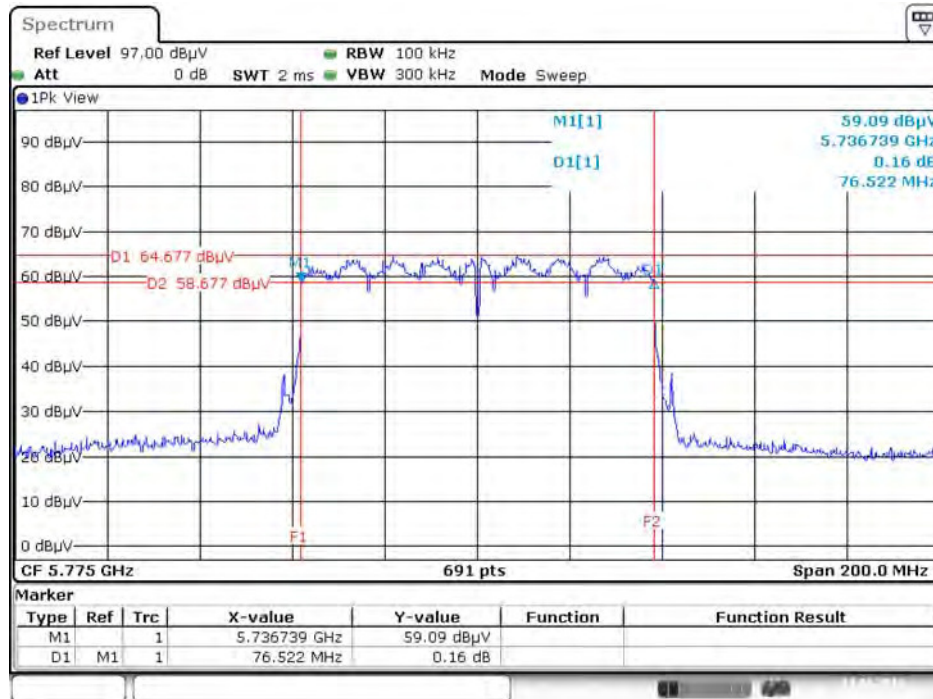
Date: 13.JAN.2016 23:41:28

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5755MHz



Date: 13.JAN.2016 23:38:58

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



Date: 13.JAN.2016 23:37:18

#### 4.4. Maximum Conducted Output Power Measurement

##### 4.4.1. Limit

| Frequency Band                                     | Limit  |
|--|--|
| <input checked="" 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. |

##### 4.4.2. Measuring Instruments and Setting

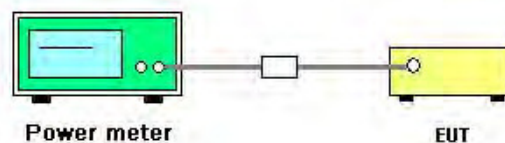
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

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

##### 4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB789033 D02 v01r01 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.

##### 4.4.4. Test Setup Layout





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

|               |              |           |               |
|---------------|--------------|-----------|---------------|
| Temperature   | 24°C         | Humidity  | 60%           |
| Test Engineer | Clemens Fang | Test Date | Jan. 13, 2016 |

<For non-beamforming mode>

For 1TX: Chain 1

| Mode    | Frequency | Conducted Power (dBm) | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|------------------|----------|
| 802.11a | 5745 MHz  | 17.71                 | 30.00            | Complies |
|         | 5785 MHz  | 17.66                 | 30.00            | Complies |
|         | 5825 MHz  | 17.83                 | 30.00            | Complies |

For 2TX: Chain 1 + Chain 2

| Mode    | Frequency | Conducted Power (dBm) |         |       | Max. Limit (dBm) | Result   |
|---------|-----------|-----------------------|---------|-------|------------------|----------|
|         |           | Chain 1               | Chain 2 | Total |                  |          |
| 802.11a | 5745 MHz  | 16.98                 | 16.82   | 19.91 | 30.00            | Complies |
|         | 5785 MHz  | 17.52                 | 17.84   | 20.69 | 30.00            | Complies |
|         | 5825 MHz  | 16.97                 | 17.35   | 20.17 | 30.00            | Complies |

<For beamforming mode>

For 2TX: Chain 1 + Chain 2

| Mode      | Frequency | Conducted Power (dBm) |         |       | Max. Limit (dBm) | Result   |
|-----------|-----------|-----------------------|---------|-------|------------------|----------|
|           |           | Chain 1               | Chain 2 | Total |                  |          |
| 802.11ac  | 5745 MHz  | 15.75                 | 15.47   | 18.62 | 27.99            | Complies |
| MCS0/Nss1 | 5785 MHz  | 17.84                 | 17.67   | 20.77 | 27.99            | Complies |
| VHT20     | 5825 MHz  | 16.35                 | 16.17   | 19.27 | 27.99            | Complies |
| 802.11ac  | 5755 MHz  | 13.19                 | 13.47   | 16.34 | 27.99            | Complies |
| MCS0/Nss1 | 5795 MHz  | 17.87                 | 17.57   | 20.73 | 27.99            | Complies |
| VHT40     |           |                       |         |       |                  |          |
| 802.11ac  | 5775 MHz  | 13.52                 | 13.28   | 16.41 | 27.99            | Complies |
| MCS0/Nss1 |           |                       |         |       |                  |          |
| VHT80     |           |                       |         |       |                  |          |

Note:  $DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 8.01 \text{ dBi}$ , so limit = 30-(8.01-6)=27.99 dBm.

## 4.5. Power Spectral Density Measurement

### 4.5.1. Limit

The following table is power spectral density limits and decrease power density limit rule refer to section 4.4.1.

|                                     | Frequency Band | Limit         |
|-------------------------------------|----------------|---------------|
| <input checked="" type="checkbox"/> | 5.725~5.85 GHz | 30 dBm/500kHz |

### 4.5.2. Measuring Instruments and Setting

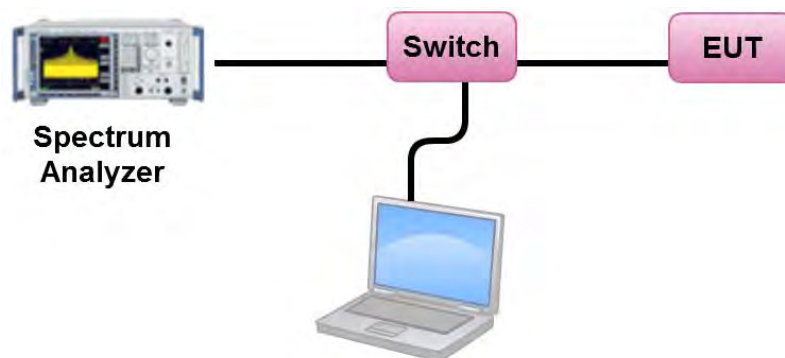
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter   | Setting  |
|--|--|
| Attenuation  | Auto   |
| Span Frequency   | 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. |  |

#### 4.5.3. 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 v01r01 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 (a) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.
5. 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  $\leq 30$  dBm.

#### 4.5.4. Test Setup Layout



#### 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 Power Spectral Density

|               |              |          |     |
|---------------|--------------|----------|-----|
| Temperature   | 24°C         | Humidity | 60% |
| Test Engineer | Clemens Fang |          |     |

<For non-beamforming mode>

##### Configuration IEEE 802.11a / Chain 1

| Channel | Frequency | Power Density (dBm/MHz) | 10log(500kHz/RBW) Factor (dB) | Power Density (dBm/500kHz) | Power Density Limit (dBm/500kHz) | Result   |
|---------|-----------|-------------------------|-------------------------------|----------------------------|----------------------------------|----------|
| 149     | 5745 MHz  | 4.66                    | -3.01                         | 1.65                       | 30.00                            | Complies |
| 157     | 5785 MHz  | 4.63                    | -3.01                         | 1.62                       | 30.00                            | Complies |
| 165     | 5825 MHz  | 4.73                    | -3.01                         | 1.72                       | 30.00                            | Complies |

##### Configuration IEEE 802.11a / Chain 1 + Chain 2

| Channel | Frequency | Power Density (dBm/MHz) | 10log(500kHz/RBW) Factor (dB) | Power Density (dBm/500kHz) | Power Density Limit (dBm/500kHz) | Result   |
|---------|-----------|-------------------------|-------------------------------|----------------------------|----------------------------------|----------|
| 149     | 5745 MHz  | 6.84                    | -3.01                         | 3.83                       | 27.99                            | Complies |
| 157     | 5785 MHz  | 7.55                    | -3.01                         | 4.54                       | 27.99                            | Complies |
| 165     | 5825 MHz  | 7.08                    | -3.01                         | 4.07                       | 27.99                            | Complies |

Note:  $DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 8.01 \text{ dBi}$ , so limit = 30-(8.01-6)=27.99 dBm/500kHz.

<For beamforming mode>

Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2

| Channel | Frequency | Power Density (dBm/MHz) | 10log(500kHz/RBW) Factor (dB) | Power Density (dBm/500kHz) | Power Density Limit (dBm/500kHz) | Result   |
|---------|-----------|-------------------------|-------------------------------|----------------------------|----------------------------------|----------|
| 149     | 5745 MHz  | 5.59                    | -3.01                         | 2.58                       | 27.99                            | Complies |
| 157     | 5785 MHz  | 7.59                    | -3.01                         | 4.58                       | 27.99                            | Complies |
| 165     | 5825 MHz  | 6.18                    | -3.01                         | 3.17                       | 27.99                            | Complies |

$$\text{Note: } DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 8.01 \text{ dBi, so limit} = 30 - (8.01 - 6) = 27.99 \text{ dBm/500kHz.}$$

Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2

| Channel | Frequency | Power Density (dBm/MHz) | 10log(500kHz/RBW) Factor (dB) | Power Density (dBm/500kHz) | Power Density Limit (dBm/500kHz) | Result   |
|---------|-----------|-------------------------|-------------------------------|----------------------------|----------------------------------|----------|
| 151     | 5755 MHz  | 0.26                    | -3.01                         | -2.75                      | 27.99                            | Complies |
| 159     | 5795 MHz  | 4.53                    | -3.01                         | 1.52                       | 27.99                            | Complies |

$$\text{Note: } DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 8.01 \text{ dBi, so limit} = 30 - (8.01 - 6) = 27.99 \text{ dBm/500kHz.}$$

Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2

| Channel | Frequency | Power Density (dBm/MHz) | 10log(500kHz/RBW) Factor (dB) | Power Density (dBm/500kHz) | Power Density Limit (dBm/500kHz) | Result   |
|---------|-----------|-------------------------|-------------------------------|----------------------------|----------------------------------|----------|
| 155     | 5775 MHz  | -2.70                   | -3.01                         | -5.71                      | 27.99                            | Complies |

$$\text{Note: } DirectionalGain = 10 \cdot \log \left[ \frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right] = 8.01 \text{ dBi, so limit} = 30 - (8.01 - 6) = 27.99 \text{ dBm/500kHz.}$$

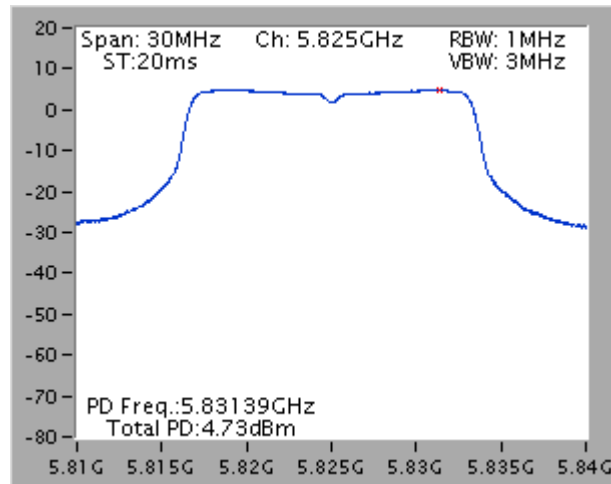
Note: All the test values were listed in the report.

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

<For non-beamforming mode>

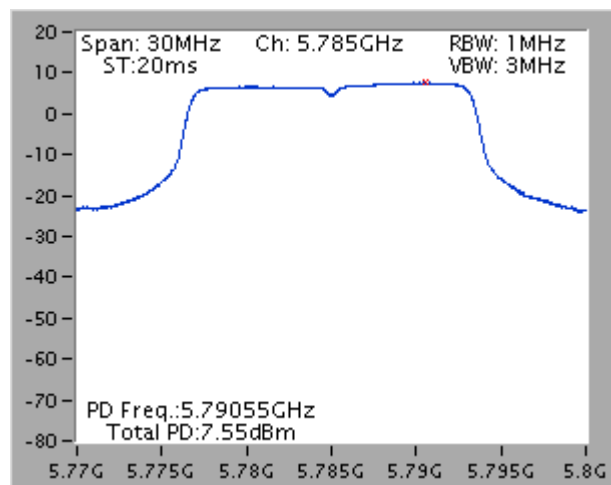
For 1TX:

Power Density Plot on Configuration IEEE 802.11a / Chain 1 / 5825 MHz



For 2TX:

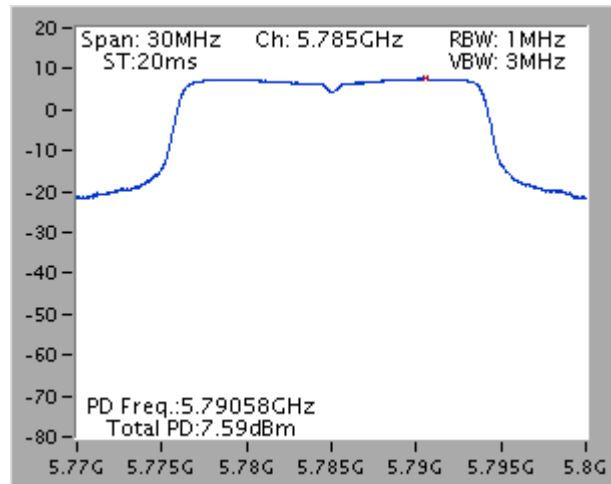
Power Density Plot on Configuration IEEE 802.11a / Chain 1 + Chain 2 / 5785 MHz



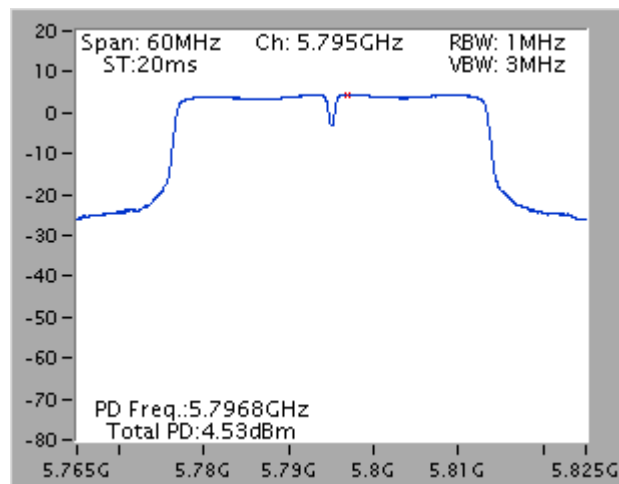
<For beamforming mode>

For 2TX:

Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT20 / Chain 1 + Chain 2 / 5785 MHz

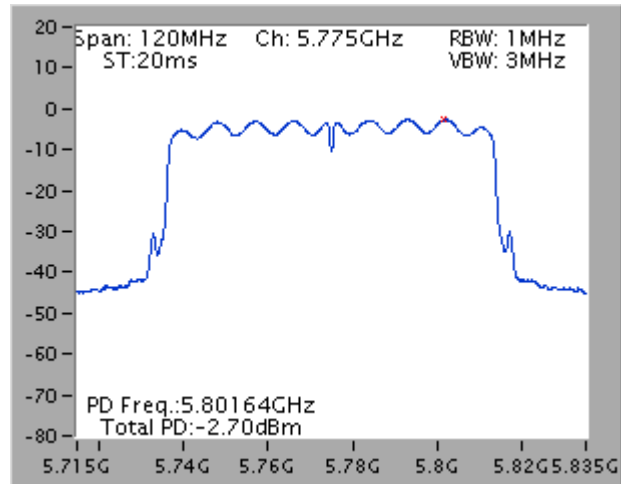


Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT40 / Chain 1 + Chain 2 / 5795 MHz





Power Density Plot on Configuration IEEE 802.11ac MCS0/Nss1 VHT80 / Chain 1 + Chain 2 / 5775 MHz



## 4.6. Radiated Emissions Measurement

### 4.6.1. Limit

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of  $-17$  dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions 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 (MHz) | Field Strength (micorvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009~0.490       | 2400/F(kHz)                       | 300                           |
| 0.490~1.705       | 24000/F(kHz)                      | 30                            |
| 1.705~30.0        | 30                                | 30                            |
| 30~88             | 100                               | 3                             |
| 88~216            | 150                               | 3                             |
| 216~960           | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

### 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 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                             |

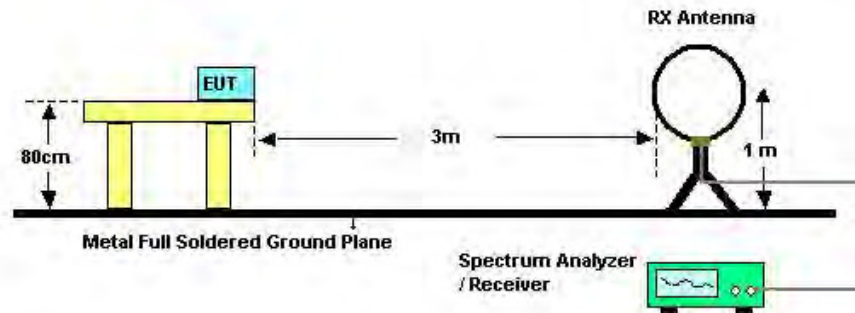
| Receiver Parameter     | Setting                           |
|------------------------|-----------------------------------|
| Attenuation            | Auto                              |
| Start ~ Stop Frequency | 9kHz~150kHz / RBW 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RBW 9kHz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

#### 4.6.3. Test Procedures

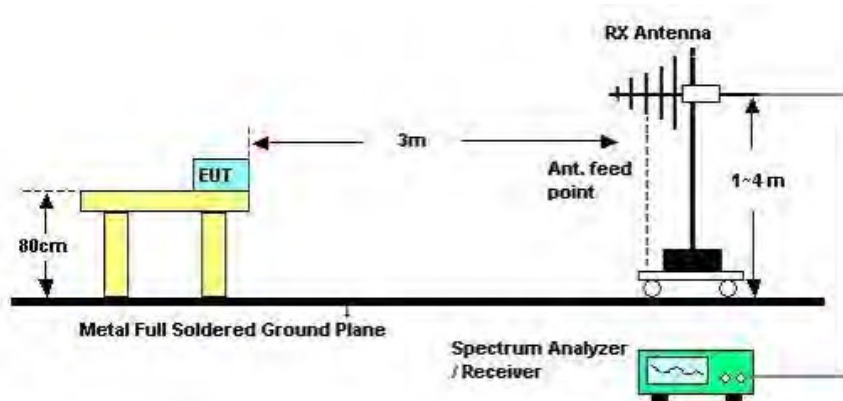
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting 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.

#### 4.6.4. Test Setup Layout

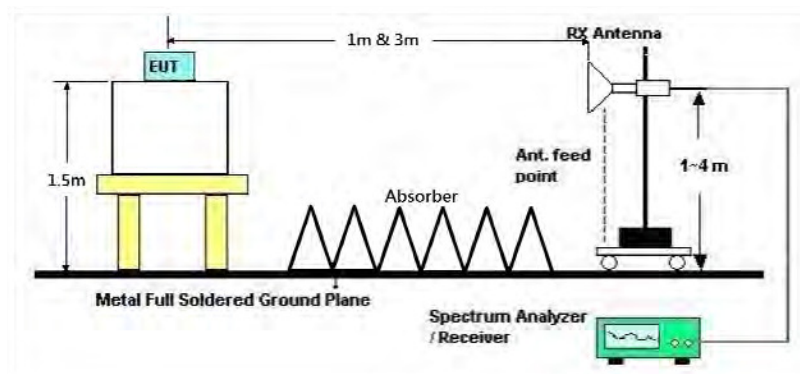
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



#### 4.6.5. Test Deviation

There is no deviation with the original standard.

#### 4.6.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

|                      |                         |                       |             |
|----------------------|-------------------------|-----------------------|-------------|
| <b>Temperature</b>   | 26°C                    | <b>Humidity</b>       | 68%         |
| <b>Test Engineer</b> | Lucas Huang / Andy Tsai | <b>Configurations</b> | Normal Link |
| <b>Test Date</b>     | Nov. 28, 2014           |                       |             |

| Freq. (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (dBuV) | Remark   |
|-------------|--------------|-----------------|-------------------|----------|
| -           | -            | -               | -                 | See Note |

Note:

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

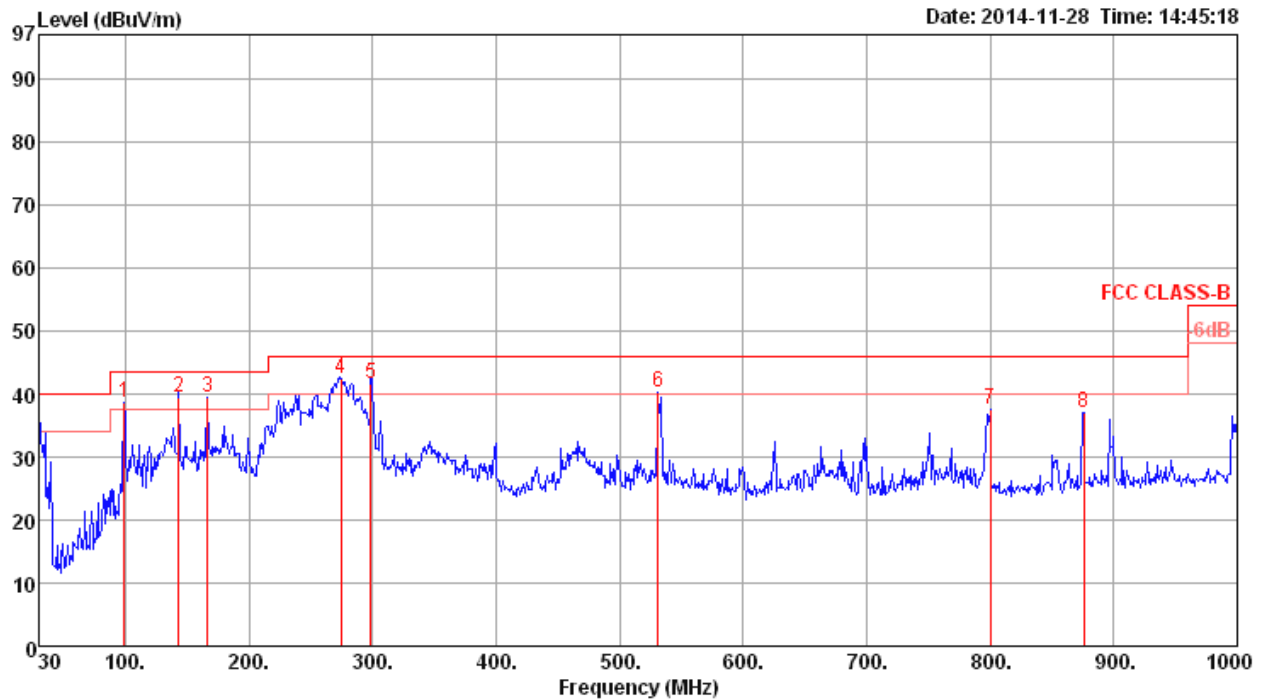
Distance extrapolation factor =  $40 \log(\text{specific distance} / \text{test distance})$  (dB);

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

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

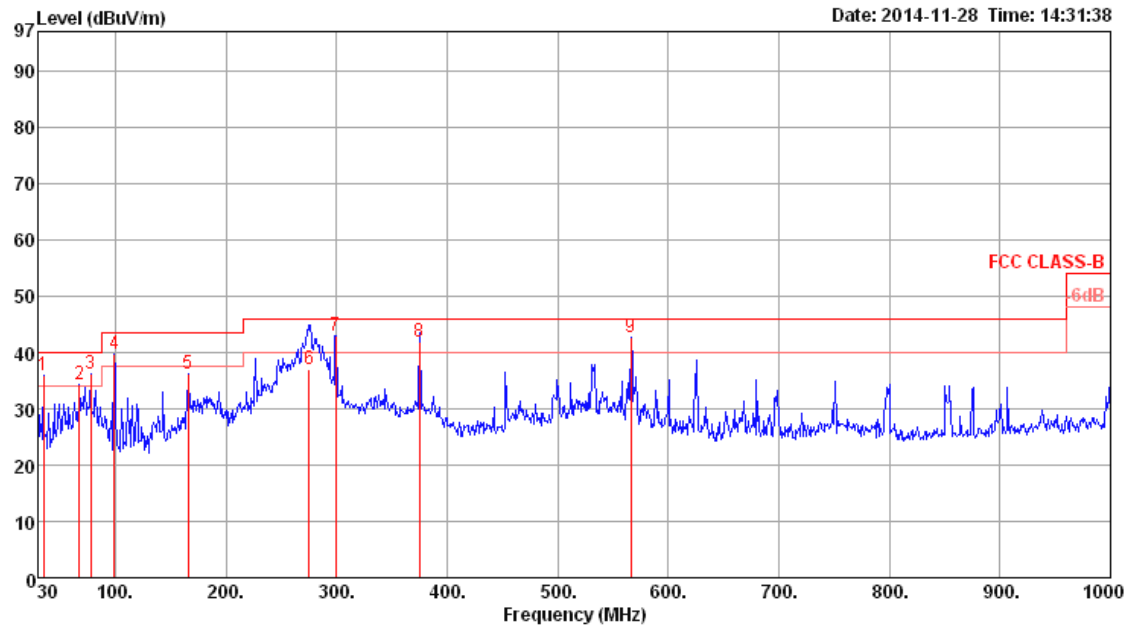
|               |                         |                |             |
|---------------|-------------------------|----------------|-------------|
| Temperature   | 26°C                    | Humidity       | 68%         |
| Test Engineer | Lucas Huang / Andy Tsai | Configurations | Normal Link |

Horizontal



|   | Freq   | Level  | Limit  | Over  | Read  | CableAntenna | Preamp | Remark     | A/Pos | T/Pos | Pol/Phase  |
|---|--------|--------|--------|-------|-------|--------------|--------|------------|-------|-------|------------|
|   | MHz    | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB         | cm    | deg   |            |
| 1 | 98.87  | 38.76  | 43.50  | -4.74 | 54.41 | 1.17         | 10.79  | 27.61 Peak | 100   | 0     | HORIZONTAL |
| 2 | 143.49 | 39.55  | 43.50  | -3.95 | 53.34 | 1.42         | 12.17  | 27.38 Peak | 100   | 0     | HORIZONTAL |
| 3 | 166.77 | 39.33  | 43.50  | -4.17 | 52.60 | 1.46         | 12.54  | 27.27 Peak | 100   | 0     | HORIZONTAL |
| 4 | 274.44 | 42.52  | 46.00  | -3.48 | 54.51 | 1.90         | 13.06  | 26.95 Peak | 100   | 0     | HORIZONTAL |
| 5 | 298.69 | 41.67  | 46.00  | -4.33 | 53.19 | 2.03         | 13.35  | 26.90 Peak | 100   | 0     | HORIZONTAL |
| 6 | 531.49 | 40.14  | 46.00  | -5.86 | 47.52 | 2.74         | 17.98  | 28.10 Peak | 100   | 0     | HORIZONTAL |
| 7 | 800.18 | 37.47  | 46.00  | -8.53 | 42.08 | 3.22         | 19.77  | 27.60 Peak | 100   | 0     | HORIZONTAL |
| 8 | 875.84 | 37.10  | 46.00  | -8.90 | 40.74 | 3.46         | 20.35  | 27.45 Peak | 100   | 0     | HORIZONTAL |

**Vertical**



|   | Freq   | Level  | Limit  | Over  | Read  | Cable | Antenna | Preamp | Remark | A/Pos | T/Pos | Pol/Phase |
|---|--------|--------|--------|-------|-------|-------|---------|--------|--------|-------|-------|-----------|
|   | MHz    | dBuV/m | dBuV/m | dB    | dBuV  | dB    | dB/m    | dB     |        | cm    | deg   |           |
| 1 | 34.85  | 36.04  | 40.00  | -3.96 | 47.06 | 0.70  | 16.08   | 27.80  | Peak   | 400   | 0     | VERTICAL  |
| 2 | 67.83  | 34.26  | 40.00  | -5.74 | 54.35 | 0.97  | 6.67    | 27.73  | Peak   | 400   | 0     | VERTICAL  |
| 3 | 77.53  | 36.33  | 40.00  | -3.67 | 56.04 | 0.95  | 7.03    | 27.69  | Peak   | 400   | 0     | VERTICAL  |
| 4 | 98.87  | 39.75  | 43.50  | -3.75 | 55.40 | 1.17  | 10.79   | 27.61  | Peak   | 400   | 0     | VERTICAL  |
| 5 | 165.80 | 36.21  | 43.50  | -7.29 | 49.56 | 1.45  | 12.47   | 27.27  | Peak   | 400   | 0     | VERTICAL  |
| 6 | 275.41 | 36.90  | 46.00  | -9.10 | 48.87 | 1.91  | 13.07   | 26.95  | QP     | 298   | 360   | VERTICAL  |
| 7 | 299.66 | 42.85  | 46.00  | -3.15 | 54.36 | 2.03  | 13.36   | 26.90  | Peak   | 400   | 0     | VERTICAL  |
| 8 | 375.32 | 42.00  | 46.00  | -4.00 | 51.83 | 2.20  | 15.40   | 27.43  | QP     | 159   | 224   | VERTICAL  |
| 9 | 566.41 | 42.75  | 46.00  | -3.25 | 49.68 | 2.79  | 18.38   | 28.10  | Peak   | 400   | 0     | 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.

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

<For non-beamforming mode>

|               |               |                |                               |
|---------------|---------------|----------------|-------------------------------|
| Temperature   | 26°C          | Humidity       | 68%                           |
| Test Engineer | Charlie Cheng | Configurations | IEEE 802.11a CH 149 / Chain 1 |
| Test Date     | Dec. 15, 2015 |                |                               |

##### Horizontal

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11486.52 | 44.57  | 54.00      | -9.43      | 24.50      | 14.24      | 39.20          | 33.37         | 166   | 309   | Average | HORIZONTAL |
| 2 | 11490.90 | 56.62  | 74.00      | -17.38     | 36.55      | 14.24      | 39.20          | 33.37         | 166   | 309   | Peak    | HORIZONTAL |

##### Vertical

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11487.08 | 57.01  | 74.00      | -16.99     | 36.94      | 14.24      | 39.20          | 33.37         | 194   | 295   | Peak    | VERTICAL  |
| 2 | 11493.24 | 44.56  | 54.00      | -9.44      | 24.49      | 14.24      | 39.20          | 33.37         | 194   | 295   | Average | VERTICAL  |





|                      |               |                       |                               |
|----------------------|---------------|-----------------------|-------------------------------|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%                           |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 157 / Chain 1 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |                               |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11565.74 | 44.03  | 54.00      | -9.97      | 23.87      | 14.35      | 39.20          | 33.39         | 180   | 289   | Average | HORIZONTAL |
| 2 | 11566.42 | 57.75  | 74.00      | -16.25     | 37.59      | 14.35      | 39.20          | 33.39         | 180   | 289   | Peak    | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11565.42 | 44.99  | 54.00      | -9.01      | 24.83      | 14.35      | 39.20          | 33.39         | 177   | 295   | Average | VERTICAL  |
| 2 | 11567.12 | 57.96  | 74.00      | -16.04     | 37.80      | 14.35      | 39.20          | 33.39         | 177   | 295   | Peak    | VERTICAL  |



|                      |               |                       |                               |
|----------------------|---------------|-----------------------|-------------------------------|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%                           |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 165 / Chain 1 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |                               |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11646.70 | 45.29  | 54.00      | -8.71      | 25.05      | 14.45      | 39.20          | 33.41         | 196   | 307   | Average | HORIZONTAL |
| 2 | 11651.86 | 56.84  | 74.00      | -17.16     | 36.54      | 14.51      | 39.20          | 33.41         | 196   | 307   | Peak    | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11646.20 | 44.18  | 54.00      | -9.82      | 23.94      | 14.45      | 39.20          | 33.41         | 182   | 301   | Average | VERTICAL  |
| 2 | 11654.04 | 57.37  | 74.00      | -16.63     | 37.07      | 14.51      | 39.20          | 33.41         | 182   | 301   | Peak    | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 149 /<br>Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11482.48 | 54.97  | 74.00      | -19.03     | 38.31      | 12.86      | 39.15          | 35.35         | 159   | 177   | Peak    | HORIZONTAL |
| 2 | 11493.48 | 43.14  | 54.00      | -10.86     | 26.39      | 12.90      | 39.20          | 35.35         | 159   | 177   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11481.76 | 54.77  | 74.00      | -19.23     | 38.11      | 12.86      | 39.15          | 35.35         | 144   | 184   | Peak    | VERTICAL  |
| 2 | 11498.28 | 43.13  | 54.00      | -10.87     | 26.38      | 12.90      | 39.20          | 35.35         | 144   | 184   | Average | VERTICAL  |

|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 157 /<br>Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

### Horizontal

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11576.88 | 55.60  | 74.00      | -18.40     | 38.78      | 12.99             | 39.20          | 35.37         | 155   | 185   | Peak    | HORIZONTAL |
| 2 | 11577.72 | 43.70  | 54.00      | -10.30     | 26.88      | 12.99             | 39.20          | 35.37         | 155   | 185   | Average | HORIZONTAL |

### Vertical

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11575.36 | 57.23  | 74.00      | -16.77     | 40.41      | 12.99             | 39.20          | 35.37         | 140   | 177   | Peak    | VERTICAL  |
| 2 | 11579.96 | 43.64  | 54.00      | -10.36     | 26.82      | 12.99             | 39.20          | 35.37         | 140   | 177   | Average | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 165 /<br>Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11646.24 | 56.49  | 74.00      | -17.51     | 39.60      | 13.08      | 39.20          | 35.39         | 135   | 155   | Peak    | HORIZONTAL |
| 2 | 11655.20 | 44.65  | 54.00      | -9.35      | 27.71      | 13.13      | 39.20          | 35.39         | 135   | 155   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11647.60 | 44.35  | 54.00      | -9.65      | 27.46      | 13.08      | 39.20          | 35.39         | 152   | 164   | Average | VERTICAL  |
| 2 | 11657.68 | 56.66  | 74.00      | -17.34     | 39.72      | 13.13      | 39.20          | 35.39         | 152   | 164   | Peak    | VERTICAL  |

<For beamforming mode>

|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT20 CH 149 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11488.01 | 61.16  | 74.00      | -12.84     | 41.09      | 14.24             | 39.20          | 33.37         | 150   | 258   | Peak    | HORIZONTAL |
| 2 | 11489.74 | 47.96  | 54.00      | -6.04      | 27.89      | 14.24             | 39.20          | 33.37         | 150   | 258   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11480.26 | 48.63  | 54.00      | -5.37      | 28.66      | 14.19             | 39.15          | 33.37         | 150   | 295   | Average | VERTICAL  |
| 2 | 11481.79 | 61.32  | 74.00      | -12.68     | 41.35      | 14.19             | 39.15          | 33.37         | 150   | 295   | Peak    | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT20 CH 157 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11561.76 | 60.22  | 74.00      | -13.78     | 40.06      | 14.35             | 39.20          | 33.39         | 150   | 251   | Peak    | HORIZONTAL |
| 2 | 11569.04 | 47.80  | 54.00      | -6.20      | 27.64      | 14.35             | 39.20          | 33.39         | 150   | 251   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11568.94 | 61.33  | 74.00      | -12.67     | 41.17      | 14.35             | 39.20          | 33.39         | 150   | 185   | Peak    | VERTICAL  |
| 2 | 11572.21 | 47.73  | 54.00      | -6.27      | 27.57      | 14.35             | 39.20          | 33.39         | 150   | 185   | Average | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT20 CH 165 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11642.15 | 47.90  | 54.00      | -6.10      | 27.66      | 14.45             | 39.20          | 33.41         | 150   | 215   | Average | HORIZONTAL |
| 2 | 11642.79 | 60.82  | 74.00      | -13.18     | 40.58      | 14.45             | 39.20          | 33.41         | 150   | 215   | Peak    | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11640.77 | 48.18  | 54.00      | -5.82      | 27.94      | 14.45             | 39.20          | 33.41         | 150   | 248   | Average | VERTICAL  |
| 2 | 11650.00 | 61.73  | 74.00      | -12.27     | 41.49      | 14.45             | 39.20          | 33.41         | 150   | 248   | Peak    | VERTICAL  |





|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT40 CH 151 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11508.01 | 61.04  | 74.00      | -12.96     | 40.97      | 14.24             | 39.20          | 33.37         | 150   | 159   | Peak    | HORIZONTAL |
| 2 | 11513.65 | 47.83  | 54.00      | -6.17      | 27.77      | 14.24             | 39.20          | 33.38         | 150   | 159   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11500.06 | 47.76  | 54.00      | -6.24      | 27.69      | 14.24             | 39.20          | 33.37         | 150   | 159   | Average | VERTICAL  |
| 2 | 11503.62 | 60.28  | 74.00      | -13.72     | 40.21      | 14.24             | 39.20          | 33.37         | 150   | 159   | Peak    | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT40 CH 159 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11591.12 | 60.22  | 74.00      | -13.78     | 40.02      | 14.40             | 39.20          | 33.40         | 150   | 254   | Peak    | HORIZONTAL |
| 2 | 11599.68 | 47.92  | 54.00      | -6.08      | 27.72      | 14.40             | 39.20          | 33.40         | 150   | 254   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11589.36 | 60.61  | 74.00      | -13.39     | 40.41      | 14.40             | 39.20          | 33.40         | 150   | 186   | Peak    | VERTICAL  |
| 2 | 11590.83 | 47.68  | 54.00      | -6.32      | 27.48      | 14.40             | 39.20          | 33.40         | 150   | 186   | Average | VERTICAL  |



|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT80 CH 155 / Chain 1 + Chain |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Horizontal**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 11501.51 | 60.72  | 74.00      | -13.28     | 40.65      | 14.24             | 39.20          | 33.37         | 150   | 196   | Peak    | HORIZONTAL |
| 2 | 11502.92 | 47.71  | 54.00      | -6.29      | 27.64      | 14.24             | 39.20          | 33.37         | 150   | 196   | Average | HORIZONTAL |

**Vertical**

|   | Freq     | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|----------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 11504.90 | 60.61  | 74.00      | -13.39     | 40.54      | 14.24             | 39.20          | 33.37         | 150   | 216   | Peak    | VERTICAL  |
| 2 | 11518.94 | 47.79  | 54.00      | -6.21      | 27.68      | 14.29             | 39.20          | 33.38         | 150   | 216   | Average | 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.

## 4.7. Band Edge Emissions Measurement

### 4.7.1. 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.

For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an e.i.r.p. of  $-17$  dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions 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>(microvolts/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                                |

### 4.7.2. 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                             |

### 4.7.3. Test Procedures

1. The test procedure is the same as section 4.6.3.

### 4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

### 4.7.5. Test Deviation

There is no deviation with the original standard.

#### 4.7.6. EUT Operation during Test

For Non-beamforming mode:

The EUT was programmed to be in continuously transmitting mode.

For beamforming mode:

The EUT was programmed to be in beamforming transmitting mode.

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

|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%                                     |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 149, 157, 165 / Chain 1 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |   |

##### Channel 149

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 5713.60 | 64.76  | 68.20      | -3.44      | 54.95      | 8.51              | 34.43          | 33.13         | 150   | 290   | Peak    | VERTICAL  |
| 2 | 5725.00 | 72.36  | 78.20      | -5.84      | 62.58      | 8.47              | 34.44          | 33.13         | 150   | 290   | Peak    | VERTICAL  |
| 3 | 5738.60 | 108.92 |            |            | 99.15      | 8.47              | 34.44          | 33.14         | 150   | 290   | Peak    | VERTICAL  |
| 4 | 5740.00 | 99.43  |            |            | 89.69      | 8.43              | 34.45          | 33.14         | 150   | 290   | Average | VERTICAL  |

Item 3, 4 are the fundamental frequency at 5745 MHz.

##### Channel 157

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase  |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|------------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |            |
| 1 | 5703.80 | 62.19  | 68.20      | -6.01      | 52.34      | 8.56              | 34.42          | 33.13         | 220   | 315   | Peak    | HORIZONTAL |
| 2 | 5722.20 | 61.63  | 78.20      | -16.57     | 51.85      | 8.47              | 34.44          | 33.13         | 220   | 315   | Peak    | HORIZONTAL |
| 3 | 5790.60 | 106.11 |            |            | 96.47      | 8.31              | 34.48          | 33.15         | 220   | 315   | Peak    | HORIZONTAL |
| 4 | 5791.40 | 97.03  |            |            | 87.39      | 8.31              | 34.48          | 33.15         | 220   | 315   | Average | HORIZONTAL |
| 5 | 5851.20 | 62.45  | 78.20      | -15.75     | 52.55      | 8.56              | 34.51          | 33.17         | 220   | 315   | Peak    | HORIZONTAL |
| 6 | 5865.40 | 63.36  | 68.20      | -4.84      | 53.38      | 8.64              | 34.52          | 33.18         | 220   | 315   | Peak    | HORIZONTAL |

Item 3, 4 are the fundamental frequency at 5785 MHz.

##### Channel 165

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | CableAntenna Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|---------|--------|------------|------------|------------|-------------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB                | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 5830.60 | 108.82 |            |            | 99.02      | 8.47              | 34.50          | 33.17         | 142   | 287   | Peak    | VERTICAL  |
| 2 | 5831.40 | 99.77  |            |            | 89.97      | 8.47              | 34.50          | 33.17         | 142   | 287   | Average | VERTICAL  |
| 3 | 5852.60 | 67.32  | 78.20      | -10.88     | 57.42      | 8.56              | 34.51          | 33.17         | 142   | 287   | Peak    | VERTICAL  |
| 4 | 5860.80 | 64.03  | 68.20      | -4.17      | 54.05      | 8.64              | 34.52          | 33.18         | 142   | 287   | Peak    | VERTICAL  |

Item 1, 2 are the fundamental frequency at 5825 MHz.

|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11a CH 149, 157, 165 /<br>Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Channel 149**

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss | Preamp<br>Factor | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|---------------|---------------|---------------|----------------------|------------------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                   | dB/m             | dB    | cm    | deg    |           |          |
| 1 | 5714.80 | 64.92  | 68.20         | -3.28         | 55.11         | 8.51                 | 34.43            | 33.13 | 257   | 77     | Peak      | VERTICAL |
| 2 | 5723.20 | 75.84  | 78.20         | -2.36         | 66.06         | 8.47                 | 34.44            | 33.13 | 257   | 77     | Peak      | VERTICAL |
| 3 | 5738.80 | 112.17 |               |               | 102.43        | 8.43                 | 34.45            | 33.14 | 257   | 77     | Peak      | VERTICAL |
| 4 | 5739.80 | 102.73 |               |               | 92.99         | 8.43                 | 34.45            | 33.14 | 257   | 77     | Average   | VERTICAL |

Item 3, 4 are the fundamental frequency at 5745 MHz.

**Channel 157**

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss | Preamp<br>Factor | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|---------------|---------------|---------------|----------------------|------------------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                   | dB/m             | dB    | cm    | deg    |           |          |
| 1 | 5711.80 | 63.70  | 68.20         | -4.50         | 53.89         | 8.51                 | 34.43            | 33.13 | 207   | 66     | Peak      | VERTICAL |
| 2 | 5724.20 | 61.05  | 78.20         | -17.15        | 51.27         | 8.47                 | 34.44            | 33.13 | 207   | 66     | Peak      | VERTICAL |
| 3 | 5791.40 | 103.83 |               |               | 94.19         | 8.31                 | 34.48            | 33.15 | 207   | 66     | Average   | VERTICAL |
| 4 | 5791.80 | 112.44 |               |               | 102.80        | 8.31                 | 34.48            | 33.15 | 207   | 66     | Peak      | VERTICAL |
| 5 | 5854.20 | 63.67  | 78.20         | -14.53        | 53.77         | 8.56                 | 34.51            | 33.17 | 207   | 66     | Peak      | VERTICAL |
| 6 | 5884.20 | 63.08  | 68.20         | -5.12         | 53.01         | 8.72                 | 34.53            | 33.18 | 207   | 66     | Peak      | VERTICAL |

Item 3, 4 are the fundamental frequency at 5785 MHz.

**Channel 165**

|   | Freq    | Level  | Limit<br>Line | Over<br>Limit | Read<br>Level | CableAntenna<br>Loss | Preamp<br>Factor | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|---------------|---------------|---------------|----------------------|------------------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m        | dB            | dBuV          | dB                   | dB/m             | dB    | cm    | deg    |           |          |
| 1 | 5818.60 | 112.65 |               |               | 102.93        | 8.39                 | 34.49            | 33.16 | 144   | 285    | Peak      | VERTICAL |
| 2 | 5819.80 | 103.45 |               |               | 93.73         | 8.39                 | 34.49            | 33.16 | 144   | 285    | Average   | VERTICAL |
| 3 | 5857.80 | 70.09  | 78.20         | -8.11         | 60.10         | 8.64                 | 34.52            | 33.17 | 144   | 285    | Peak      | VERTICAL |
| 4 | 5860.00 | 66.52  | 68.20         | -1.68         | 56.54         | 8.64                 | 34.52            | 33.18 | 144   | 285    | Peak      | VERTICAL |

Item 1, 2 are the fundamental frequency at 5825 MHz.

|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%   |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT20 CH 149,<br>157, 165 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |   |

**Channel 149**

|   | Freq    | Level  | Limit  | Over  | Read   | CableAntenna | Preamp | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|--------|-------|--------|--------------|--------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV   | dB           | dB/m   | dB    | cm    | deg    |           |          |
| 1 | 5707.50 | 65.83  | 74.00  | -8.17 | 56.02  | 8.51         | 34.43  | 33.13 | 180   | 283    | Peak      | VERTICAL |
| 2 | 5715.00 | 50.02  | 54.00  | -3.98 | 40.21  | 8.51         | 34.43  | 33.13 | 180   | 283    | Average   | VERTICAL |
| 3 | 5724.49 | 76.63  | 78.20  | -1.57 | 66.85  | 8.47         | 34.44  | 33.13 | 180   | 283    | Peak      | VERTICAL |
| 4 | 5739.87 | 97.08  |        |       | 87.34  | 8.43         | 34.45  | 33.14 | 180   | 283    | Average   | VERTICAL |
| 5 | 5749.97 | 112.03 |        |       | 102.29 | 8.43         | 34.45  | 33.14 | 180   | 283    | Peak      | VERTICAL |

Item 4, 5 are the fundamental frequency at 5745 MHz.

**Channel 157**

|   | Freq    | Level  | Limit  | Over   | Read   | CableAntenna | Preamp | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|--------|--------|--------|--------------|--------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV   | dB           | dB/m   | dB    | cm    | deg    |           |          |
| 1 | 5690.77 | 61.21  | 74.00  | -12.79 | 51.36  | 8.56         | 34.42  | 33.13 | 178   | 301    | Peak      | VERTICAL |
| 2 | 5704.87 | 49.89  | 54.00  | -4.11  | 40.04  | 8.56         | 34.42  | 33.13 | 178   | 301    | Average   | VERTICAL |
| 3 | 5722.76 | 60.50  | 78.20  | -17.70 | 50.72  | 8.47         | 34.44  | 33.13 | 178   | 301    | Peak      | VERTICAL |
| 4 | 5778.59 | 102.32 |        |        | 92.65  | 8.35         | 34.47  | 33.15 | 178   | 301    | Average   | VERTICAL |
| 5 | 5780.51 | 112.38 |        |        | 102.71 | 8.35         | 34.47  | 33.15 | 178   | 301    | Peak      | VERTICAL |
| 6 | 5850.00 | 61.33  | 78.20  | -16.87 | 51.43  | 8.56         | 34.51  | 33.17 | 178   | 301    | Peak      | VERTICAL |
| 7 | 5865.13 | 50.03  | 54.00  | -3.97  | 40.05  | 8.64         | 34.52  | 33.18 | 178   | 301    | Average   | VERTICAL |
| 8 | 5873.46 | 61.44  | 74.00  | -12.56 | 51.37  | 8.72         | 34.53  | 33.18 | 178   | 301    | Peak      | VERTICAL |

Item 4, 5 are the fundamental frequency at 5785 MHz.

**Channel 165**

|   | Freq    | Level  | Limit  | Over  | Read   | CableAntenna | Preamp | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|--------|-------|--------|--------------|--------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV   | dB           | dB/m   | dB    | cm    | deg    |           |          |
| 1 | 5819.55 | 113.59 |        |       | 103.87 | 8.39         | 34.49  | 33.16 | 178   | 285    | Peak      | VERTICAL |
| 2 | 5831.57 | 98.28  |        |       | 88.48  | 8.47         | 34.50  | 33.17 | 178   | 285    | Average   | VERTICAL |
| 3 | 5850.00 | 76.29  | 78.20  | -1.91 | 66.39  | 8.56         | 34.51  | 33.17 | 178   | 285    | Peak      | VERTICAL |
| 4 | 5860.00 | 52.24  | 54.00  | -1.76 | 42.26  | 8.64         | 34.52  | 33.18 | 178   | 285    | Average   | VERTICAL |
| 5 | 5860.58 | 66.74  | 74.00  | -7.26 | 56.76  | 8.64         | 34.52  | 33.18 | 178   | 285    | Peak      | VERTICAL |

Item 1, 2 are the fundamental frequency at 5825 MHz.





|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%  |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT40<br>CH 151, 159 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |  |

**Channel 151**

|   | Freq    | Level  | Limit  | Over  | Read  | CableAntenna | Preamp | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|--------|-------|-------|--------------|--------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m | dB    | dBuV  | dB           | dB/m   | dB    | cm    | deg    |           |          |
| 1 | 5713.01 | 67.57  | 74.00  | -6.43 | 57.76 | 8.51         | 34.43  | 33.13 | 180   | 293    | Peak      | VERTICAL |
| 2 | 5715.00 | 52.47  | 54.00  | -1.53 | 42.66 | 8.51         | 34.43  | 33.13 | 180   | 293    | Average   | VERTICAL |
| 3 | 5724.55 | 74.47  | 78.20  | -3.73 | 64.69 | 8.47         | 34.44  | 33.13 | 180   | 293    | Peak      | VERTICAL |
| 4 | 5758.85 | 96.41  |        |       | 86.70 | 8.39         | 34.46  | 33.14 | 180   | 293    | Average   | VERTICAL |
| 5 | 5770.39 | 106.81 |        |       | 97.11 | 8.39         | 34.46  | 33.15 | 180   | 293    | Peak      | VERTICAL |

Item 4, 5 are the fundamental frequency at 5755 MHz.

**Channel 159**

|   | Freq    | Level  | Limit  | Over   | Read   | CableAntenna | Preamp | A/Pos | T/Pos | Remark | Pol/Phase |          |
|---|---------|--------|--------|--------|--------|--------------|--------|-------|-------|--------|-----------|----------|
|   | MHz     | dBuV/m | dBuV/m | dB     | dBuV   | dB           | dB/m   | dB    | cm    | deg    |           |          |
| 1 | 5714.23 | 61.56  | 74.00  | -12.44 | 51.75  | 8.51         | 34.43  | 33.13 | 189   | 298    | Peak      | VERTICAL |
| 2 | 5715.00 | 49.78  | 54.00  | -4.22  | 39.97  | 8.51         | 34.43  | 33.13 | 189   | 298    | Average   | VERTICAL |
| 3 | 5718.40 | 65.09  | 78.20  | -13.11 | 55.28  | 8.51         | 34.43  | 33.13 | 189   | 298    | Peak      | VERTICAL |
| 4 | 5791.47 | 95.42  |        |        | 85.78  | 8.31         | 34.48  | 33.15 | 189   | 298    | Average   | VERTICAL |
| 5 | 5792.12 | 112.03 |        |        | 102.39 | 8.31         | 34.48  | 33.15 | 189   | 298    | Peak      | VERTICAL |
| 6 | 5851.73 | 67.69  | 78.20  | -10.51 | 57.79  | 8.56         | 34.51  | 33.17 | 189   | 298    | Peak      | VERTICAL |
| 7 | 5860.71 | 50.82  | 54.00  | -3.18  | 40.84  | 8.64         | 34.52  | 33.18 | 189   | 298    | Average   | VERTICAL |
| 8 | 5871.92 | 65.37  | 74.00  | -8.63  | 55.39  | 8.64         | 34.52  | 33.18 | 189   | 298    | Peak      | VERTICAL |

Item 4, 5 are the fundamental frequency at 5795 MHz.



|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 68%   |
| <b>Test Engineer</b> | Charlie Cheng | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss1 VHT80<br>CH 155 / Chain 1 + Chain 2 |
| <b>Test Date</b>     | Dec. 15, 2015 |                       |   |

**Channel 155**

|   | Freq    | Level  | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark  | Pol/Phase |
|---|---------|--------|------------|------------|------------|------------|----------------|---------------|-------|-------|---------|-----------|
|   | MHz     | dBuV/m | dBuV/m     | dB         | dBuV       | dB         | dB/m           | dB            | cm    | deg   |         |           |
| 1 | 5700.64 | 66.97  | 74.00      | -7.03      | 57.12      | 8.56       | 34.42          | 33.13         | 175   | 292   | Peak    | VERTICAL  |
| 2 | 5715.00 | 52.35  | 54.00      | -1.65      | 42.54      | 8.51       | 34.43          | 33.13         | 175   | 292   | Average | VERTICAL  |
| 3 | 5723.72 | 75.31  | 78.20      | -2.89      | 65.53      | 8.47       | 34.44          | 33.13         | 175   | 292   | Peak    | VERTICAL  |
| 4 | 5738.46 | 107.74 |            |            | 97.97      | 8.47       | 34.44          | 33.14         | 175   | 292   | Peak    | VERTICAL  |
| 5 | 5774.20 | 90.74  |            |            | 81.07      | 8.35       | 34.47          | 33.15         | 175   | 292   | Average | VERTICAL  |
| 6 | 5852.56 | 72.28  | 78.20      | -5.92      | 62.38      | 8.56       | 34.51          | 33.17         | 175   | 292   | Peak    | VERTICAL  |
| 7 | 5860.00 | 66.50  | 74.00      | -7.50      | 56.52      | 8.64       | 34.52          | 33.18         | 175   | 292   | Peak    | VERTICAL  |
| 8 | 5860.60 | 50.35  | 54.00      | -3.65      | 40.37      | 8.64       | 34.52          | 33.18         | 175   | 292   | Average | VERTICAL  |

Item 4, 5 are the fundamental frequency at 5775 MHz.

Note:

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

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

## 4.8. Frequency Stability Measurement

### 4.8.1. 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).

### 4.8.2. Measuring Instruments and Setting

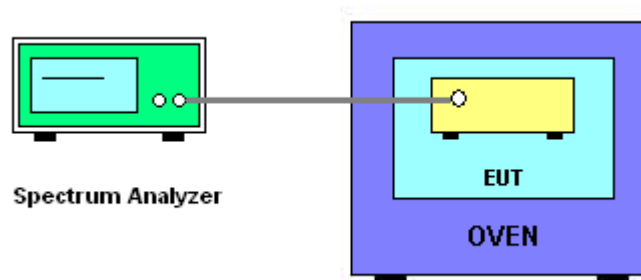
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

### 4.8.3. 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. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
7. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
8. Extreme temperature is  $-20^\circ\text{C} \sim 70^\circ\text{C}$ .

### 4.8.4. Test Setup Layout



#### 4.8.5. Test Deviation

There is no deviation with the original standard.

#### 4.8.6. EUT Operation during Test

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

#### 4.8.7. Test Result of Frequency Stability

|                      |              |                  |               |
|----------------------|--------------|------------------|---------------|
| <b>Temperature</b>   | 24°C         | <b>Humidity</b>  | 60%           |
| <b>Test Engineer</b> | Clemens Fang | <b>Test Date</b> | Jan. 13, 2016 |

Mode: 20 MHz / Chain 1

##### Voltage vs. Frequency Stability

| Voltage<br>(V)       | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
|                      | 5785 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| 126.50               | 5785.0286                   | 5785.0272     | 5785.0254     | 5785.0233     |
| 110.00               | 5785.0274                   | 5785.0261     | 5785.0245     | 5785.0226     |
| 93.50                | 5785.0260                   | 5785.0249     | 5785.0237     | 5785.0215     |
| Max. Deviation (MHz) | <b>0.0285</b>               | <b>0.0271</b> | <b>0.0253</b> | <b>0.0233</b> |
| Max. Deviation (ppm) | <b>4.94</b>                 | <b>4.69</b>   | <b>4.38</b>   | <b>4.02</b>   |
| Result               | Complies                    |               |               |               |

##### Temperature vs. Frequency Stability

| Temperature<br>(°C)  | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
|                      | 5785 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| -20                  | 5785.0328                   | 5785.0315     | 5785.0298     | 5785.0274     |
| -10                  | 5785.0313                   | 5785.0301     | 5785.0285     | 5785.0266     |
| 0                    | 5785.0299                   | 5785.0287     | 5785.0268     | 5785.0246     |
| 10                   | 5785.0286                   | 5785.0273     | 5785.0258     | 5785.0240     |
| 20                   | 5785.0274                   | 5785.0261     | 5785.0245     | 5785.0226     |
| 30                   | 5785.0260                   | 5785.0249     | 5785.0235     | 5785.0219     |
| 40                   | 5785.0244                   | 5785.0229     | 5785.0213     | 5785.0193     |
| 50                   | 5785.0227                   | 5785.0215     | 5785.0200     | 5785.0173     |
| 60                   | 5785.0203                   | 5785.0188     | 5785.0172     | 5785.0152     |
| 70                   | 5785.0174                   | 5785.0162     | 5785.0147     | 5785.0120     |
| Max. Deviation (MHz) | <b>0.0328</b>               | <b>0.0315</b> | <b>0.0298</b> | <b>0.0274</b> |
| Max. Deviation (ppm) | <b>5.66</b>                 | <b>5.44</b>   | <b>5.14</b>   | <b>4.73</b>   |
| Result               | Complies                    |               |               |               |

Mode: 40 MHz / Chain 1

Voltage vs. Frequency Stability

Voltage vs. Frequency Stability

| Voltage              | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
| (V)                  | 5755 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| 126.50               | 5755.0333                   | 5755.0319     | 5755.0301     | 5755.0280     |
| 110.00               | 5755.0321                   | 5755.0308     | 5755.0292     | 5755.0273     |
| 93.50                | 5755.0307                   | 5755.0296     | 5755.0284     | 5755.0262     |
| Max. Deviation (MHz) | <b>0.0333</b>               | <b>0.0319</b> | <b>0.0301</b> | <b>0.0280</b> |
| Max. Deviation (ppm) | <b>5.79</b>                 | <b>5.55</b>   | <b>5.24</b>   | <b>4.87</b>   |
| Result               | Complies                    |               |               |               |

Temperature vs. Frequency Stability

| Temperature          | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
| (°C)                 | 5755 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| -20                  | 5755.0375                   | 5755.0362     | 5755.0345     | 5755.0321     |
| -10                  | 5755.0360                   | 5755.0348     | 5755.0332     | 5755.0313     |
| 0                    | 5755.0346                   | 5755.0334     | 5755.0315     | 5755.0293     |
| 10                   | 5755.0333                   | 5755.0320     | 5755.0305     | 5755.0287     |
| 20                   | 5755.0321                   | 5755.0308     | 5755.0292     | 5755.0273     |
| 30                   | 5755.0307                   | 5755.0296     | 5755.0282     | 5755.0266     |
| 40                   | 5755.0291                   | 5755.0276     | 5755.0260     | 5755.0240     |
| 50                   | 5755.0274                   | 5755.0262     | 5755.0247     | 5755.0220     |
| 60                   | 5755.0250                   | 5755.0235     | 5755.0219     | 5755.0199     |
| 70                   | 5755.0221                   | 5755.0209     | 5755.0194     | 5755.0167     |
| Max. Deviation (MHz) | <b>0.0375</b>               | <b>0.0362</b> | <b>0.0345</b> | <b>0.0321</b> |
| Max. Deviation (ppm) | <b>6.52</b>                 | <b>6.30</b>   | <b>6.00</b>   | <b>5.58</b>   |
| Result               | Complies                    |               |               |               |



Mode: 80 MHz / Chain 1

Voltage vs. Frequency Stability

| Voltage              | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
| (V)                  | 5775 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| 126.50               | 5775.0268                   | 5775.0254     | 5775.0236     | 5775.0215     |
| 110.00               | 5775.0256                   | 5775.0243     | 5775.0227     | 5775.0208     |
| 93.50                | 5775.0242                   | 5775.0231     | 5775.0219     | 5775.0197     |
| Max. Deviation (MHz) | <b>0.0268</b>               | <b>0.0254</b> | <b>0.0236</b> | <b>0.0215</b> |
| Max. Deviation (ppm) | <b>4.64</b>                 | <b>4.40</b>   | <b>4.09</b>   | <b>3.73</b>   |
| Result               | Complies                    |               |               |               |

Temperature vs. Frequency Stability

| Temperature          | Measurement Frequency (MHz) |               |               |               |
|----------------------|-----------------------------|---------------|---------------|---------------|
| (°C)                 | 5775 MHz                    |               |               |               |
|                      | 0 Minute                    | 2 Minute      | 5 Minute      | 10 Minute     |
| -20                  | 5775.0310                   | 5775.0297     | 5775.0280     | 5775.0256     |
| -10                  | 5775.0295                   | 5775.0283     | 5775.0267     | 5775.0248     |
| 0                    | 5775.0281                   | 5775.0269     | 5775.0250     | 5775.0228     |
| 10                   | 5775.0268                   | 5775.0255     | 5775.0240     | 5775.0222     |
| 20                   | 5775.0256                   | 5775.0243     | 5775.0227     | 5775.0208     |
| 30                   | 5775.0242                   | 5775.0231     | 5775.0217     | 5775.0201     |
| 40                   | 5775.0226                   | 5775.0211     | 5775.0195     | 5775.0175     |
| 50                   | 5775.0209                   | 5775.0197     | 5775.0182     | 5775.0155     |
| 60                   | 5775.0185                   | 5775.0170     | 5775.0154     | 5775.0134     |
| 70                   | 5775.0156                   | 5775.0144     | 5775.0129     | 5775.0102     |
| Max. Deviation (MHz) | <b>0.0310</b>               | <b>0.0297</b> | <b>0.0280</b> | <b>0.0256</b> |
| Max. Deviation (ppm) | <b>5.37</b>                 | <b>5.15</b>   | <b>4.85</b>   | <b>4.44</b>   |
| Result               | Complies                    |               |               |               |

## 4.9. Antenna Requirements

### 4.9.1. 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.

### 4.9.2. 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                |
|----------------------------|--------------|------------------|---------------|------------------|------------------|-----------------------|
| EMI Test Receiver          | R&S          | ESCS 30          | 100355        | 9kHz ~ 2.75GHz   | Apr. 12, 2013    | Conduction (CO01-CB)  |
| MXE EMI Receiver           | Agilent      | N9038A           | MY52260140    | 9kHz ~ 8GHz      | Dec. 25, 2013    | Conduction (CO01-CB)  |
| LISN                       | F.C.C.       | FCC-LISN-50-16-2 | 04083         | 150kHz ~ 100MHz  | Nov. 23, 2013    | Conduction (CO01-CB)  |
| LISN                       | Schwarzbeck  | NSLK 8127        | 8127647       | 9kHz ~ 30MHz     | Nov. 23, 2013    | Conduction (CO01-CB)  |
| COND Cable                 | Woken        | Cable            | 01            | 150kHz ~ 30MHz   | Dec. 04, 2013    | Conduction (CO01-CB)  |
| Software                   | Audix        | E3               | 5.410e        | -                | N.C.R.           | Conduction (CO01-CB)  |
| BILOG ANTENNA              | Schaffner    | CBL6112D         | 22021         | 20MHz ~ 2GHz     | May 26, 2014     | Radiation (O3CH01-CB) |
| Loop Antenna               | Teseq        | HLA 6120         | 24155         | 9 kHz - 30 MHz   | Nov. 05, 2012*   | Radiation (O3CH01-CB) |
| Horn Antenna               | EMCO         | 3115             | 00075790      | 750MHz ~ 18GHz   | Oct. 22, 2015    | Radiation (O3CH01-CB) |
| Horn Antenna               | Schwarzbeck  | BBHA 9170        | BBHA9170252   | 15GHz ~ 40GHz    | Jul. 21, 2015    | Radiation (O3CH01-CB) |
| Pre-Amplifier              | Agilent      | 8447D            | 2944A10991    | 0.1MHz ~ 1.3GHz  | Nov. 15, 2014    | Radiation (O3CH01-CB) |
| Pre-Amplifier              | Agilent      | 8449B            | 3008A02310    | 1GHz ~ 26.5GHz   | Jan. 12, 2015    | Radiation (O3CH01-CB) |
| Pre-Amplifier              | WM           | TF-130N-R1       | 923365        | 26GHz ~ 40GHz    | Feb.10, 2015     | Radiation (O3CH01-CB) |
| Spectrum analyzer          | R&S          | FSP40            | 100019        | 9kHz~40GHz       | Dec. 02, 2013    | Radiation (O3CH01-CB) |
| Spectrum Analyzer          | R&S          | FSP40            | 100056        | 9kHz ~ 40GHz     | Oct. 27, 2015    | Radiation (O3CH01-CB) |
| EMI Test Receiver          | Agilent      | N9038A           | MY52260123    | 9kHz ~ 8GHz      | Dec. 12, 2013    | Radiation (O3CH01-CB) |
| RF Cable-low               | Woken        | Low Cable-1      | N/A           | 30 MHz - 1 GHz   | Nov. 15, 2014    | Radiation (O3CH01-CB) |
| RF Cable-high              | Woken        | High Cable-16    | N/A           | 1 GHz ~ 18 GHz   | Nov. 02, 2015    | Radiation (O3CH01-CB) |
| RF Cable-high              | Woken        | High Cable-17    | N/A           | 1 GHz ~ 18 GHz   | Nov. 02, 2015    | Radiation (O3CH01-CB) |
| RF Cable-high              | Woken        | High Cable-40G-1 | N/A           | 18GHz ~ 40 GHz   | Nov. 02, 2015    | Radiation (O3CH01-CB) |
| RF Cable-high              | Woken        | High Cable-40G-2 | N/A           | 18GHz ~ 40 GHz   | Nov. 02, 2015    | Radiation (O3CH01-CB) |
| Spectrum analyzer          | R&S          | FSV40            | 100979        | 9kHz~40GHz       | Dec. 09, 2015    | Conducted (TH01-CB)   |
| Temp. and Humidity Chamber | Ten Billion  | TTH-D3SP         | TBN-931011    | -30~100 degree   | Jun. 02, 2015    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | RG402            | High Cable-7  | 1 GHz – 26.5 GHz | Nov. 02, 2015    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | RG402            | High Cable-8  | 1 GHz – 26.5 GHz | Nov. 02, 2015    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | RG402            | High Cable-9  | 1 GHz – 26.5 GHz | Nov. 02, 2015    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | RG402            | High Cable-10 | 1 GHz – 26.5 GHz | Nov. 02, 2015    | Conducted (TH01-CB)   |
| RF Cable-high              | Woken        | RG402            | High Cable-6  | 1 GHz – 26.5 GHz | Nov. 02, 2015    | Conducted (TH01-CB)   |
| Power Sensor               | Agilent      | U2021XA          | MY53410001    | 50MHz~18GHz      | Nov. 02, 2015    | Conducted (TH01-CB)   |
| Power Sensor               | Agilent      | U2021XA          | MY53410002    | 50MHz~18GHz      | Nov. 02, 2015    | Conducted (TH01-CB)   |

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

“\*” Calibration Interval of instruments listed above is two years.

N.C.R means Non-Calibration required.



## 6. MEASUREMENT UNCERTAINTY

| Test Items                           | Uncertainty | Remark                   |
|--------------------------------------|-------------|--------------------------|
| Conducted Emission (150kHz ~ 30MHz)  | 3.2 dB      | Confidence levels of 95% |
| Radiated Emission (30MHz ~ 1,000MHz) | 3.6 dB      | Confidence levels of 95% |
| 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% |