



# SPORTON International Inc.

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## FCC RADIO TEST REPORT

|                            |   |
|----------------------------|---|
| Applicant's company        | ASUSTeK COMPUTER INC.   |
| Applicant Address          | 4F, No. 150, Li-Te Rd., Peitou, Taipei 112, Taiwan  |
| FCC ID                     | MSQ-RTGW00  |
| Manufacturer's company (1) | ASKEY TECHNOLOGY (JIANG SU) LTD   |
| Manufacturer Address       | NO1388, Jiao Tong Road, Wujiang Economic Technological Development Area Jiangsu Province 215200 China |
| Manufacturer's company (2) | Compal Networking (KunShan) Co., LTD.   |
| Manufacturer Address       | No. 520, Nabbang Rd., Economic & Technical Development Zone Kunshan, Jiangsu Province China           |

|                   |  |
|-------------------|--|
| Product Name      | Wireless-AC3100 Dual Band Gigabit Router |
| Brand Name        | ASUS                                     |
| Model No.         | RT-AC3100,RT-AC88R,RT-AC88U              |
| Test Rule Part(s) | 47 CFR FCC Part 15 Subpart E § 15.407    |
| Test Freq. Range  | 5150 ~ 5250MHz                           |
| Received Date     | Apr. 10, 2015                            |
| Final Test Date   | Sep. 08, 2015                            |
| 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 v01, KDB662911 D01 v02r01, KDB644545 D03 v01.**

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



Testing Laboratory

1190

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## History of This Test Report

| REPORT NO.    | VERSION | DESCRIPTION             | ISSUED DATE   |
|---------------|---------|-------------------------|---------------|
| FR531828-03AB | Rev. 01 | Initial issue of report | Nov. 05, 2015 |
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## 1. VERIFICATION OF COMPLIANCE

Product Name : Wireless-AC3100 Dual Band Gigabit Router  
Brand Name : ASUS  
Model No. : RT-AC3100,RT-AC88R,RT-AC88U  
Applicant : ASUSTeK COMPUTER INC.  
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 Apr. 10, 2015 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

For adding Adapter 4 ~ 6 and Second Red, Black Heat sink test record

| 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 | 3.21 dB     |
| 4.2  | 15.407(b)    | Radiated Emissions                | Complies | 4.68 dB     |
| 4.3  | 15.203       | Antenna Requirements              | Complies | -           |

For EUT Rev 5.01 test record

| Applied Standard: 47 CFR FCC Part 15 Subpart E |              |                      |          |             |
|--|--------------|----------------------|----------|-------------|
| Part   | Rule Section | Description of Test  | Result   | Under Limit |
| 4.2  | 15.407(b)    | Radiated Emissions   | Complies | 4.89 dB     |
| 4.3  | 15.203       | Antenna Requirements | Complies | -           |

### 3. GENERAL INFORMATION

#### 3.1. Product Details

| Items                    | Description   |
|--------------------------|---|
| Product Type             | For 2.4GHz Band: WLAN (3TX/3RX, 4TX/4RX)<br>For 5GHz Band: WLAN (3TX/3RX, 4TX/4RX)  |
| Radio Type               | Intentional Transceiver   |
| Power Type               | From power adapter  |
| 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, 1024QAM)   |
| Data Rate (Mbps)         | IEEE 802.11a: OFDM (6/9/12/18/24/36/48/54)<br>IEEE 802.11n/ac: see the below table  |
| Frequency Range          | 5150 ~ 5250MHz  |
| Channel Number           | 4 for 20MHz bandwidth ; 2 for 40MHz bandwidth<br>1 for 80MHz bandwidth  |
| Channel Band Width (99%) | <u>For Non-Beamforming Mode</u><br>IEEE 802.11a: 16.15 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 17.62 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 37.33 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz<br>IEEE 802.11ac MCS0/Nss4 (VHT40): 36.76 MHz<br>IEEE 802.11ac MCS0/Nss4 (VHT80): 76.12 MHz<br><u>For Beamforming Mode</u><br>IEEE 802.11ac MCS0/Nss1 (VHT20): 18.06 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 36.90 MHz<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 76.12 MHz |

|                                |   |
|--------------------------------|---|
| Maximum Conducted Output Power | <u>For Non-Beamforming Mode</u><br>IEEE 802.11a: 26.88 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT20): 26.89 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 29.73 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 24.24 dBm<br>IEEE 802.11ac MCS0/Nss4 (VHT40): 26.33 dBm<br>IEEE 802.11ac MCS0/Nss4 (VHT80): 25.98 dBm<br><u>For Beamforming Mode</u><br>IEEE 802.11ac MCS0/Nss1 (VHT20): 26.53 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT40): 26.49 dBm<br>IEEE 802.11ac MCS0/Nss1 (VHT80): 26.45 dBm |
| Carrier Frequencies            | Please refer to section 3.4   |
| Antenna                        | Please refer to section 3.3   |

| Items                | Description  |  |
|----------------------|--|--|
| Communication Mode   | <input checked="" type="checkbox"/> IP Based (Load Based)                          | <input type="checkbox"/> Frame Based         |
| Beamforming Function | <input checked="" type="checkbox"/> With beamforming for 802.11n/ac in 2.4GHz/5GHz | <input type="checkbox"/> Without beamforming |
| Operating Mode       | <input type="checkbox"/> Outdoor access point                                      |  |
|                      | <input checked="" type="checkbox"/> Indoor access point                            |  |
|                      | <input type="checkbox"/> Fixed point-to-point access points                        |  |
|                      | <input type="checkbox"/> Mobile and portable client devices                        |  |

#### Antenna and Band width

| Antenna       | Three (TX) |        |        | Four (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)   | 3, 4                            | MCS0-23, MCS0-31               |
| 802.11n (HT40)   | 3, 4                            | MCS0-23, MCS0-31               |
| 802.11ac (VHT20) | 3, 4                            | MCS0-11/Nss1-3, MCS0-11/Nss1-4 |
| 802.11ac (VHT40) | 3, 4                            | MCS0-11/Nss1-3, MCS0-11/Nss1-4 |
| 802.11ac (VHT80) | 3, 4                            | MCS0-11/Nss1-3, MCS0-11/Nss1-4 |

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

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

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

**3.2. Accessories**

| Power                             | Brand | Model      | Rating   |
|-----------------------------------|-------|------------|--|
| Adapter 1                         | ASUS  | ADP-45BW B | Input: 100-240V ~ 50-60Hz 1.2A<br>Output: 19V, 2.37A |
| Adapter 2                         | ASUS  | AD883J20   | Input: 100-240V ~ 50-60Hz 1.0A<br>Output: 19V, 2.37A |
| Adapter 3                         | ASUS  | ADP-65DW B | Input: 100-240V ~ 50-60Hz 1.5A<br>Output: 19V, 3.42A |
| Adapter 4                         | ASUS  | ADP-45BW B | Input: 100-240V ~ 50-60Hz 1.2A<br>Output: 19V, 2.37A |
| Adapter 5                         | ASUS  | AD883J20   | Input: 100-240V ~ 50-60Hz 1.0A<br>Output: 19V, 2.37A |
| Adapter 6                         | ASUS  | ADP-65DW B | Input: 100-240V ~ 50-60Hz 1.5A<br>Output: 19V, 3.42A |
| <b>Other</b>                      |       |            |  |
| RJ-45 Cable*1: Non-Shielded, 1.5m |       |            |  |

### 3.3. Table for Filed Antenna

| Set | Brand  | P/N                        | Antenna Type   | Connector    | Gain (dBi) |      | Color Ring |
|-----|--------|----------------------------|----------------|--------------|------------|------|------------|
|     |        |                            |                |              | 2.4GHz     | 5GHz |            |
| 1   | PSA    | RFDPA171300SBLB809         | Dipole Antenna | Reversed-SMA | 2.25       | 3.37 | Red        |
| 2   | PSA    | RFDPA171300SBLB810         | Dipole Antenna | Reversed-SMA | 2.25       | 3.37 | Black      |
| 3   | PSA    | RFDPA171300SBLB811         | Dipole Antenna | Reversed-SMA | 2.20       | 3.36 | Black      |
| 4   | PSA    | RFDPA171300SBLB812         | Dipole Antenna | Reversed-SMA | 2.18       | 3.19 | Black      |
| 5   | PSA    | RFDPA171300SBLB813         | Dipole Antenna | Reversed-SMA | 2.20       | 3.36 | Red        |
| 6   | PSA    | RFDPA171300SBLB814         | Dipole Antenna | Reversed-SMA | 2.18       | 3.19 | Red        |
| 7   | WHA YU | C660-510345-A(SRF2015719)  | Dipole Antenna | Reversed-SMA | 2.25       | 3.20 | Red        |
| 8   | WHA YU | C660-510346-A(SRF2015720)  | Dipole Antenna | Reversed-SMA | 2.25       | 3.20 | Black      |
| 9   | WHA YU | C660-510364-A(SRF20151386) | Dipole Antenna | Reversed-SMA | 1.9        | 3.3  | Black      |
| 10  | WHA YU | C660-510365-A(SRF20151717) | Dipole Antenna | Reversed-SMA | 1.9        | 3.3  | Black      |

Note: 1. The EUT has ten sets of antenna and there are four antennas for each set.

2. Both antennas above are the same type. Besides, only set 1 antenna was selected to perform the test and written in this report due to the highest gain.

**For IEEE 802.11a/b/g/n/ac mode:**

**For 2.4GHz and 5GHz (3TX/3RX) function:**

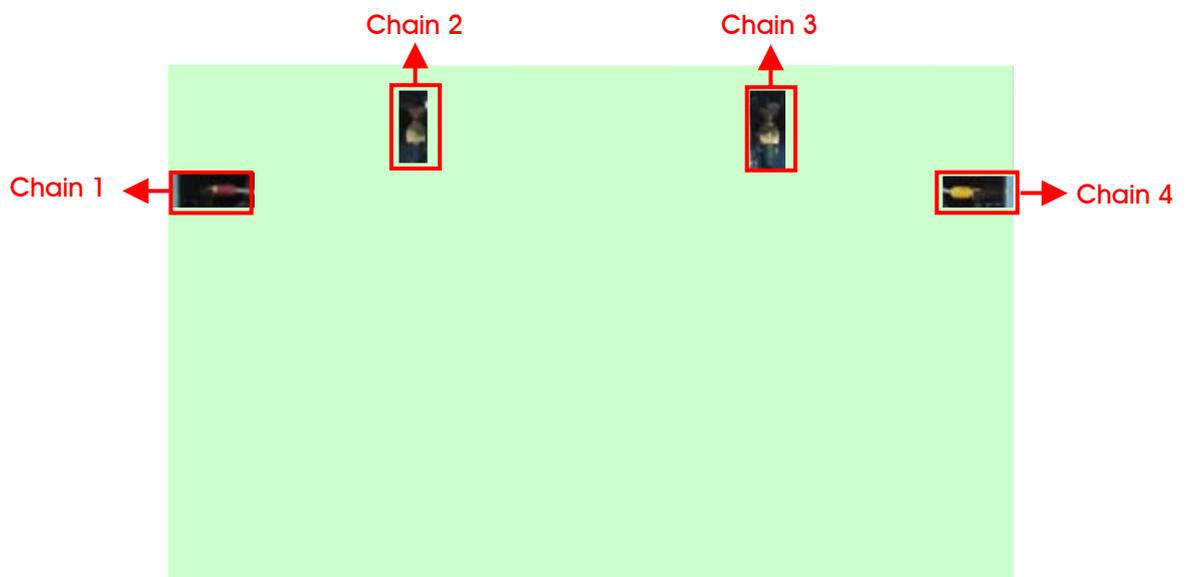
Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antenna.

Chain 1, Chain 2 and Chain 3 could transmit/receive simultaneously.

**For 2.4GHz and 5GHz (4TX/4RX) function:**

Chain 1, Chain 2, Chain 3 and Chain 4 can be used as transmitting/receiving antenna.

Chain 1, Chain 2, Chain 3 and Chain 4 could transmit/receive simultaneously.



### 3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48.

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

For 80MHz bandwidth systems, use Channel 42.

| Frequency Band          | Channel No. | Frequency | Channel No. | Frequency |
|-------------------------|-------------|-----------|-------------|-----------|
| 5150~5250 MHz<br>Band 1 | 36          | 5180 MHz  | 44          | 5220 MHz  |
|                         | 38          | 5190 MHz  | 46          | 5230 MHz  |
|                         | 40          | 5200 MHz  | 48          | 5240 MHz  |
|                         | 42          | 5210 MHz  | -           | -         |

### 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.

Verify below items for adding Adapter 4 ~ 6

| Test Items                  | Mode | Data Rate | Channel | Chain |
|-----------------------------|------|-----------|---------|-------|
| AC Power Conducted Emission | CTX  | -         | -       | -     |

Verify below items for adding Adapter 4 ~ 6 and Second Red, Black Heat sink

| Test Items                   | Mode | Data Rate | Channel | Chain |
|------------------------------|------|-----------|---------|-------|
| Radiated Emission Below 1GHz | CTX  | -         | -       | -     |

Verify below items for adding Second Red, Black Heat sink

| Test Items                   | Mode                     | Data Rate | Channel   | Chain    |         |
|------------------------------|--------------------------|-----------|-----------|----------|---------|
| Radiated Emission Above 1GHz | For Non-Beamforming Mode |           |           |          |         |
|                              | 11a/BPSK                 | Band 1    | 6Mbps     | 36/40/48 | 1+2+3+4 |
|                              | 11ac VHT40               | Band 1    | MCS0/Nss4 | 38       | 1+2+3+4 |

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

2. The EUT can only be used at laying position.

The following test modes were performed for all tests:

#### **For Conducted Emission and Radiated Emissions Below 1GHz test:**

There are two modes of EUT, one is EUT With 2.4GHz mode, and the other is EUT With 5GHz mode, after evaluating, EUT With 5GHz mode has been evaluated to be the worst case for original test report.

Consequently, measurement for Conducted Emission and Radiated Emissions Below 1GHz will follow this same test mode.

Mode 1. EUT (Rev 4.01) With Adapter 4+ 5GHz

Mode 2. EUT (Rev 4.01) With Adapter 5+ 5GHz

Mode 3. EUT (Rev 4.01) With Adapter 6+ 5GHz

Mode 1 is the worst case, so it was selected to record in this test report.

#### **For Radiated Emissions Above 1GHz test:**

From the above modes has been evaluated to be the worst case for original test report.

Consequently, measurement for Radiated Emissions Above 1GHz test will follow this same test mode.

Verify below items for EUT Rev 5.01

| Test Items                    | Mode | Data Rate | Channel | Chain |
|-------------------------------|------|-----------|---------|-------|
| Radiated Emissions Below 1GHz | CTX  | -         | -       | -     |

**For Radiated Emissions Below 1GHz test:**

Mode 1. EUT (Rev5.01) With Adapter 1 + 2.4GHz

Mode 2. EUT (Rev5.01) With Adapter 1 + 5GHz

Mode 2 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 ~ 4 will follow this same test mode.

Mode 3. EUT (Rev5.01) With Adapter 2+ 5GHz

Mode 4. EUT (Rev5.01) With Adapter 3+ 5GHz

Mode 2 is the worst case, so it was selected to record in this test report.

### 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. |
| 03CH01-CB          | SAC  | Hsin Chu | 262045       | IC 4086D    |
| CO01-CB            | Conduction   | Hsin Chu | 262045       | IC 4086D    |

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

### 3.7. Table for Multiple Listing

The EUT has three model numbers, which are identical to each other in all aspects except for the following table:

| Model No. | LAN Port    | Heat sink color |
|-----------|-------------|-----------------|
| RT-AC88U  | 8 LAN ports | Silver, Red     |
| RT-AC88R  | 8 LAN ports | Silver, Red     |
| RT-AC3100 | 4 LAN ports | Silver, Black   |

Note 1: From the above models, model: RT-AC88U was selected as representative model for the test and its data was recorded in this report.

Note 2: Red and Black Heat sink each of the three groups, the different just appearance.

### 3.8. Table for Class II Change

This product is an extension of original report under Sporton project number: FR531828AA

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

| Modifications  | Performance Checking   |
|--|--|
| 1. Adding eight set same type of Dipole antenna (set 3~set 10) with lower gains than the original. (Please refer to the table for filed antenna for detail)  | It's not necessary to re-test.   |
| 2. Adding the Second Red Heat sink, for model number: RT-AC88R, RT-AC88U.<br>3. Adding the Second Black Heat sink, only for model number: RT-AC3100.   | Radiated emission  |
| 4. Adding three adapters. (Adapter 4~Adapter 6)(Please refer to below table for adapter detail)  | AC Power Port Conducted emission.<br>Radiated emission Below 1GHz  |
| 5. Updating EUT version to "Rev 5.01" from "Rev 4.01".<br>(1) Adding smaller size of the heat sink of color (red for Model No.: RT-AC88U and RT-AC88R, black for Model No.: T-AC3100.)<br>(2) Adding pulse protector<br>(3) Adding Set Line Parts<br>(4) Removing EEPROM IC (UA 51, UA 52)<br><br>(5) Changing SDRAM DDR3 2GB (256MB) -> 4GB (512MB) | Radiated emission Below 1GHz   |
| 6. Adding 3TX/3RX  | After evaluating, it is not necessary to re-test.<br>Note: The 3TX powers of the rest of the test modes were based on the 3TX powers out of 4TX. |

## 1. Table for Adapter detail

(1) The difference between adapter 1 and adapter 4 as below:

| Adapter1 (model: ADP-45BW B) |             |                      |  |
|------------------------------|-------------|----------------------|--|
| Design No                    | MFG TITLE   | MFG PART             | DESCRIPTION                              |
| Q1                           | AUK         | SMK0760F             | FET 600V 7A 1.2ohm TO-220F-3P            |
| Q1                           | ST          | STP6NK60ZFP          | FET 600V 6A 1.2ohm TO-220FP-3P           |
| Q1                           | TOSHIBA     | TK10A60DR(STA4,X)    | FET 600V 10A 750mohm TO-220SIS-3P        |
| D101                         | ST          | STPS20S100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                         | ST          | STPS20SM100ST        | DIO SBD 20A 100V TO-220AB-3P             |
| D101                         | ST          | STPS30SM100ST        | DIO SBD 30A 100V TO-220AB-3P             |
| IC31                         | ON          | DAP022ASN65T1G       | IC ASIC PWM CURRENT MODE TSOP-6P SMD     |
| IC131                        | TI          | TL432BIDBZR          | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131                        | NXP         | TL431BMFDT           | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131                        | DIODES      | AS431ANTR-G1         | IC VOL REF ADJ 2.5V 100mA 0.5% SOT-23-3P |
| IC32                         | EVERLIGHT   | EL816M(Y)(D)-VG      | PHOTO TR 50mA 80V DIP-4P 150%-300%       |
| IC32                         | SHARP       | PC123Y92FZ0F         | PHOTO TR 50mA 70V DIP-4P 160%-300%       |
| IC32                         | Renesas     | PS2561DL1-1Y-V-A(G)  | EOL PHOTO TR 40mA 80V DIP-4P 150%-300%   |
| CX1                          | EUROPTRONIC | MPX2224K30B15LXD20   | CAP X2 MP PC 305VAC 0.22uF K S15         |
| CX1                          | OKAYA       | LE224-MX-30-C3.2     | CAP X2 MP PC 300VAC 0.22uF K S15         |
| CX1                          | HUA         | MKP-224K0275AB115S-G | CAP X2 MP PC 275VAC 0.22uF K S15         |
| FL1                          | DELTA       | HFV-MP13202          | LINE FILTER T14 14mH MIN                 |
| FL101                        | DELTA       | LFV-MP13303          | LINE FILTER T10 17uH MIN                 |
| T1                           | DELTA       | MV-MP13167           | TRANSFORMER MAIN RM10 1mH +/-5%          |
| C1                           | NICHICON    | UPT2G680MHD3         | CAP AL 400V 68uF M 16*25 P7.5            |
| C1                           | NCC         | EKMG401ELL680ML25S   | CAP AL 400V 68uF M 16*25 P7.5            |
| C1                           | L-Tec       | TYJ2GM680K25O        | CAP AL 400V 68uF M 16*25 P7.5            |
| CY1                          | MURATA      | DE1B3KX221KNHAN99F   | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |
| CY1                          | TDK         | CD70-B2GA221KYVK     | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |
| CY1                          | WALSIN      | YPOAH221K061DASDAB   | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |
| Adapter4 (model: ADP-45BW B) |             |                      |  |
| Design No                    | MFG TITLE   | MFG PART             | DESCRIPTION                              |
| Q1                           | TOSHIBA     | TK10A60DR(STA4,X)    | FET 600V 10A 750mohm TO-220SIS-3P        |
| Q1                           | FUJI        | FMV11N60ES           | FET 600V 11A 750mohm TO-220F-3P          |
| D101                         | ST          | STPS20S100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                         | ST          | STPS20H100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                         | ST          | STPS30H100CT         | DIO SBD 30A 100V TO-220AB-3P C.C.        |

|       |             |                      |  |
|-------|-------------|----------------------|--|
| IC31  | NeoEnergy   | DAP022AT             | IC ASIC PWM CURRENT MODE SOT-26-6P SMD   |
| IC131 | LITE-ON     | LA431OCRPA           | IC REGU ADJ 2.495V 100mA 0.4% SOT-23R-3P |
| IC131 | TI          | TL432BIDBZR          | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131 | NXP         | TL431BMFDT           | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC32  | EVERLIGHT   | EL816M(Y)(D)-VG      | PHOTO TR 50mA 80V DIP-4P 150%-300%       |
| IC32  | SHARP       | PC123Y92FZ0F         | PHOTO TR 50mA 70V DIP-4P 160%-300%       |
| IC32  | TOSHIBA     | TLP785F(D4-GRH,F     | PHOTO TR 60mA 80V DIP-4P 150%-300%       |
| CX1   | HUA         | MKP-334K0275AB115S-G | CAP X2 MP PC 275VAC 0.33uF K S15         |
| CX1   | HUA         | MKP-334K0275AB115S-P | CAP X2 MP PC 275VAC 0.33uF K S15         |
| CX1   | EUROPTRONIC | MPX2334K30B15LXD31   | CAP X2 MP PC 305VAC 0.33uF K S15         |
| FL1   | DELTA       | HFV-MP15027          | LINE FILTER T16 12.7mH MIN               |
| FL101 | DELTA       | LFV-MP13171          | LINE FILTER T6 1.55uH MIN                |
| T1    | DELTA       | MV-MP15037           | TRANSFORMER MAIN RM10 1000uH +/-5%       |
| C1    | NCC         | EKMG401ELL680ML25S   | CAP AL 400V 68uF M 16*25 P7.5            |
| CY1   | MURATA      | DE1B3KX221KNHAN99F   | CAP Y1/X1 CD 250VAC 220pF K B TP V110    |
| CY1   | WALSIN      | YP0AH221K061DASDAB   | CAP Y1/X1 CD 250VAC 220pF K B TP V110    |

(2) The difference between adapter 2 and adapter 5 as below:

| Adapter 2 (model: AD883J20) | Adapter 5 (model: AD883J20) |
|-----------------------------|-----------------------------|
| Type: 010KLF BAH            | Type: 010K-3LF              |

(3) The difference between adapter 3 and adapter 6 as below:

| Adapter 3 (model: ADP-65DW B) |             |                      |  |
|-------------------------------|-------------|----------------------|--|
| Design No                     | MFG TITLE   | MFG PART             | DESCRIPTION                              |
| Q1                            | AUK         | SMK0760F             | FET 600V 7A 1.2ohm TO-220F-3P            |
| Q1                            | ST          | STP6NK60ZFP          | FET 600V 6A 1.2ohm TO-220FP-3P           |
| Q1                            | TOSHIBA     | TK10A60DR(STA4,X)    | FET 600V 10A 750mohm TO-220SIS-3P        |
| D101                          | ST          | STPS20S100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                          | ST          | STPS20SM100ST        | DIO SBD 20A 100V TO-220AB-3P             |
| D101                          | ST          | STPS30SM100ST        | DIO SBD 30A 100V TO-220AB-3P             |
| IC31                          | ON          | DAP022ASN65T1G       | IC ASIC PWM CURRENT MODE TSOP-6P SMD     |
| IC131                         | TI          | TL432BIDBZR          | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131                         | NXP         | TL431BMFDT           | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131                         | DIODES      | AS431ANTR-G1         | IC VOL REF ADJ 2.5V 100mA 0.5% SOT-23-3P |
| IC32                          | EVERLIGHT   | EL816M(Y)(D)-VG      | PHOTO TR 50mA 80V DIP-4P 150%-300%       |
| IC32                          | SHARP       | PC123Y92FZ0F         | PHOTO TR 50mA 70V DIP-4P 160%-300%       |
| IC32                          | Renesas     | PS2561DL1-1Y-V-A(G)  | EOL PHOTO TR 40mA 80V DIP-4P 150%-300%   |
| CX1                           | EUROPTRONIC | MPX2224K30B15LXD20   | CAP X2 MP PC 305VAC 0.22uF K S15         |
| CX1                           | OKAYA       | LE224-MX-30-C3.2     | CAP X2 MP PC 300VAC 0.22uF K S15         |
| CX1                           | HUA         | MKP-224K0275AB115S-G | CAP X2 MP PC 275VAC 0.22uF K S15         |
| FL1                           | DELTA       | HFV-MP13202          | LINE FILTER T14 14mH MIN                 |
| FL101                         | DELTA       | LFV-MP13303          | LINE FILTER T10 17uH MIN                 |
| T1                            | DELTA       | MV-MP13167           | TRANSFORMER MAIN RM10 1mH +/-5%          |
| C1                            | NICHICON    | UPT2G680MHD3         | CAP AL 400V 68uF M 16*25 P7.5            |
| C1                            | NCC         | EKMG401ELL680ML25S   | CAP AL 400V 68uF M 16*25 P7.5            |
| C1                            | L-Tec       | TYJ2GM680K25O        | CAP AL 400V 68uF M 16*25 P7.5            |
| CY1                           | MURATA      | DE1B3KX221KNHAN99F   | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |
| CY1                           | TDK         | CD70-B2GA221KYVK     | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |
| CY1                           | WALSIN      | YP0AH221K061DASDAB   | CAP Y1/X1 CD 250VAC 220pF K B TP VI10    |

| Adapter 6 (model: ADP-65DW B) |            |                      |  |
|-------------------------------|------------|----------------------|--|
| Design No                     | MFG TITLE  | MFG PART             | DESCRIPTION                              |
| Q1                            | TOSHIBA    | TK10A60DR(STA4,X)    | FET 600V 10A 750mohm TO-220SIS-3P        |
| Q1                            | FUJI       | FMV11N60ES           | FET 600V 11A 750mohm TO-220F-3P          |
| D101                          | ST         | STPS20S100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                          | ST         | STPS20H100CT         | DIO SBD 20A 100V TO-220AB-3P C.C.        |
| D101                          | ST         | STPS30H100CT         | DIO SBD 30A 100V TO-220AB-3P C.C.        |
| IC31                          | NeoEnergy  | DAPO22AT             | IC ASIC PWM CURRENT MODE SOT-26-6P SMD   |
| IC131                         | LITE-ON    | LA431OCRPA           | IC REGU ADJ 2.495V 100mA 0.4% SOT-23R-3P |
| IC131                         | TI         | TL432BIDBZR          | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC131                         | NXP        | TL431BMFDT           | IC VOL REF ADJ 2.495V 100mA 0.5%         |
| IC32                          | EVERLIGHT  | EL816M(Y)(D)-VG      | PHOTO TR 50mA 80V DIP-4P 150%-300%       |
| IC32                          | SHARP      | PC123Y92FZ0F         | PHOTO TR 50mA 70V DIP-4P 160%-300%       |
| IC32                          | TOSHIBA    | TLP785F(D4-GRH,F     | PHOTO TR 60mA 80V DIP-4P 150%-300%       |
| CX1                           | HUA        | MKP-334K0275AB115S-G | CAP X2 MP PC 275VAC 0.33uF K S15         |
| CX1                           | HUA        | MKP-334K0275AB115S-P | CAP X2 MP PC 275VAC 0.33uF K S15         |
| CX1                           | EUROPTONIC | MPX2334K30B15LXD31   | CAP X2 MP PC 305VAC 0.33uF K S15         |
| FL1                           | DELTA      | HFV-MP15027          | LINE FILTER T16 12.7mH MIN               |
| FL101                         | DELTA      | LFV-MP13171          | LINE FILTER T6 1.55uH MIN                |
| T1                            | DELTA      | MV-MP15037           | TRANSFORMER MAIN RM10 1000uH +/-5%       |
| C1                            | NCC        | EKMG401ELL680ML25S   | CAP AL 400V 68uF M 16*25 P7.5            |
| CY1                           | MURATA     | DE1B3KX221KNHAN99F   | CAP Y1/X1 CD 250VAC 220pF K B TP V110    |
| CY1                           | WALSIN     | YP0AH221K061DASDAB   | CAP Y1/X1 CD 250VAC 220pF K B TP V110    |

### 3.9. Table for Supporting Units

For Test Site No: 03CH01-CB and TH01-CB

| Support Unit | Brand | Model | FCC ID |
|--------------|-------|-------|--------|
| NB           | DELL  | E4300 | DoC    |

For Test Site No: CO01-CB

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

### 3.10. 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.

For Non-Beamforming Mode

| Test Software Version    | Mtool 2.0.2.6        |          |          |
|--------------------------|----------------------|----------|----------|
| Mode                     | Test Frequency (MHz) |          |          |
|                          | NCB: 20MHz           |          |          |
|                          | 5180 MHz             | 5200 MHz | 5240 MHz |
| 802.11a                  | 80                   | 83       | 83       |
| 802.11ac MCS0/Nss1 VHT20 | 83                   | 83       | 83       |
| Mode                     | NCB: 40MHz           |          |          |
| 802.11ac MCS0/Nss1 VHT40 | 5190 MHz             |          | 5230 MHz |
|                          | 77                   |          | 95       |
| Mode                     | NCB: 80MHz           |          |          |
| 802.11ac MCS0/Nss1 VHT80 | 5210 MHz             |          |          |
|                          | 73                   |          |          |

| Test Software Version    | Mtool 2.0.2.6        |  |
|--------------------------|----------------------|--|
| Mode                     | Test Frequency (MHz) |  |
|                          | NCB: 40MHz           |  |
| 802.11ac MCS0/Nss4 VHT40 | 5190 MHz             |  |
|                          | 78                   |  |
| Mode                     | NCB: 80MHz           |  |
|                          | 5210 MHz             |  |
|                          | 79                   |  |

**4TX/4RX**
**For Non-Beamforming Mode**

| Mode                           | Frequency | Conducted Power (dBm) |         |         |         |       |
|--------------------------------|-----------|-----------------------|---------|---------|---------|-------|
|                                |           | Chain 1               | Chain 2 | Chain 3 | Chain 4 | Total |
| 802.11a                        | 5180 MHz  | 20.19                 | 19.81   | 20.08   | 20.37   | 26.14 |
|                                | 5200 MHz  | 20.82                 | 20.56   | 20.67   | 21.09   | 26.81 |
|                                | 5240 MHz  | 20.83                 | 20.76   | 20.85   | 20.98   | 26.88 |
| 802.11ac<br>MCS0/Nss1<br>VHT20 | 5180 MHz  | 20.53                 | 20.35   | 20.41   | 20.67   | 26.51 |
|                                | 5200 MHz  | 20.59                 | 20.64   | 20.62   | 21.01   | 26.74 |
|                                | 5240 MHz  | 20.89                 | 20.73   | 20.78   | 21.07   | 26.89 |
| 802.11ac<br>MCS0/Nss1<br>VHT40 | 5190 MHz  | 19.13                 | 19.04   | 19.23   | 19.15   | 25.16 |
|                                | 5230 MHz  | 23.78                 | 23.63   | 23.65   | 23.79   | 29.73 |
| 802.11ac<br>MCS0/Nss1<br>VHT80 | 5210 MHz  | 18.26                 | 18.24   | 18.22   | 18.17   | 24.24 |
| 802.11ac<br>MCS0/Nss4<br>VHT40 | 5190 MHz  | 20.38                 | 20.43   | 20.17   | 20.25   | 26.33 |
| 802.11ac<br>MCS0/Nss4<br>VHT80 | 5210 MHz  | 19.96                 | 20.09   | 19.93   | 19.84   | 25.98 |

For Beamforming Mode

| Test Software Version    | Mtool 2.0.2.6               |          |          |
|--------------------------|-----------------------------|----------|----------|
| <b>Mode</b>              | <b>Test Frequency (MHz)</b> |          |          |
|                          | <b>NCB: 20MHz</b>           |          |          |
|                          | 5180 MHz                    | 5200 MHz | 5240 MHz |
| 802.11ac MCS0/Nss1 VHT20 | 80                          | 80       | 80       |
| <b>Mode</b>              | <b>NCB: 40MHz</b>           |          |          |
|                          | 5190 MHz                    | 5230 MHz |          |
|                          | 77                          | 80       |          |
| 802.11ac MCS0/Nss1 VHT40 |                             |          |          |
| <b>Mode</b>              | <b>NCB: 80MHz</b>           |          |          |
|                          | 5210 MHz                    |          |          |
|                          | 80                          |          |          |
| 802.11ac MCS0/Nss1 VHT80 |                             |          |          |

### 3.11. 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 RX Device and transmit duty cycle no less 98%

### 3.12. Duty Cycle

#### For Non-Beamforming Mode

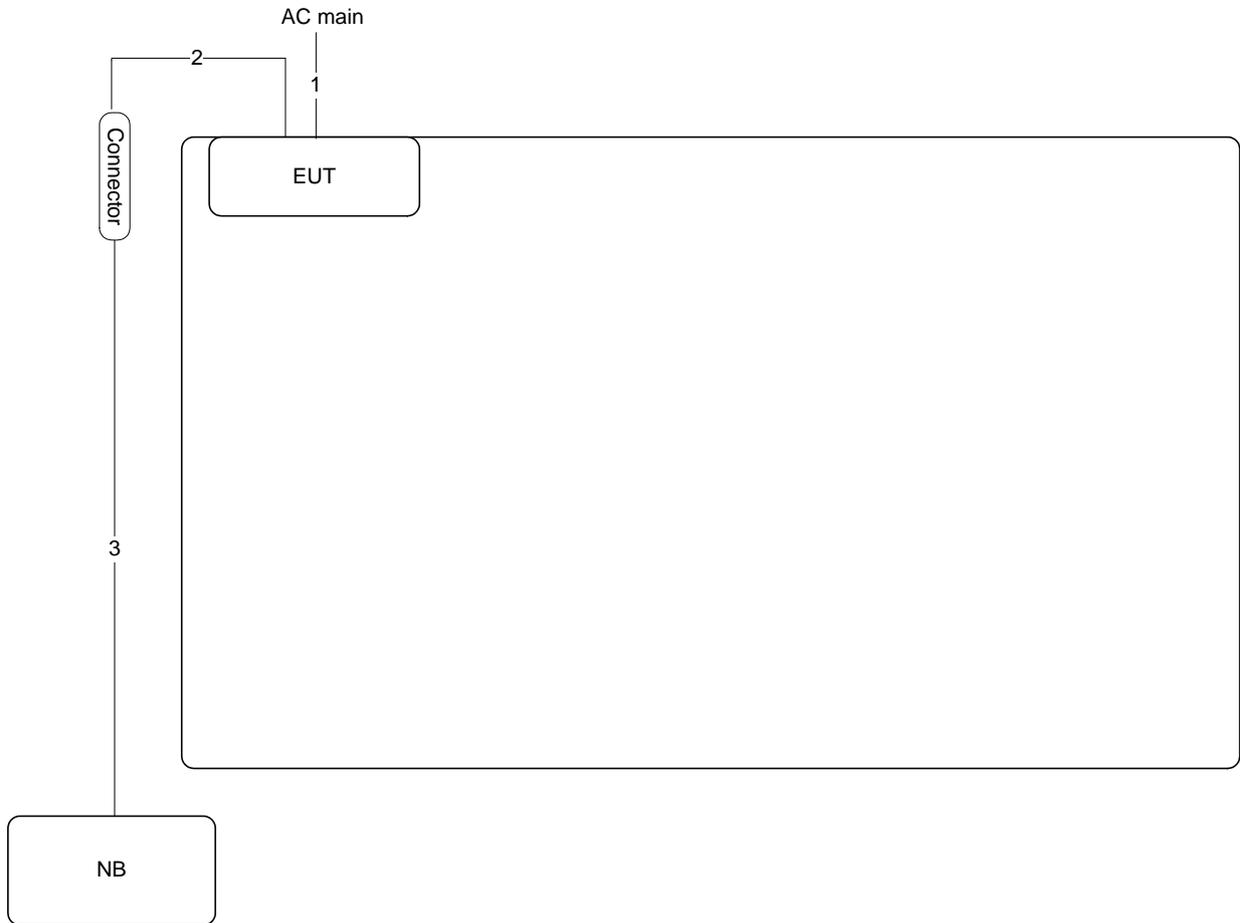
| Mode                     | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|--------------------------|--------------|------------------|----------------|------------------|-----------------------|
| 802.11a                  | 2.057        | 2.080            | 98.91%         | 0.05             | 0.01                  |
| 802.11ac MCS0/Nss1 VHT20 | 1.921        | 1.944            | 98.80%         | 0.05             | 0.01                  |
| 802.11ac MCS0/Nss1 VHT40 | 0.954        | 0.964            | 98.95%         | 0.05             | 0.01                  |
| 802.11ac MCS0/Nss1 VHT80 | 0.463        | 0.485            | 95.40%         | 0.20             | 2.16                  |
| 802.11ac MCS0/Nss4 VHT40 | 0.279        | 0.307            | 90.88%         | 0.42             | 3.58                  |
| 802.11ac MCS0/Nss4 VHT80 | 0.126        | 0.186            | 67.74%         | 1.69             | 7.94                  |

#### 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 | 4.246        | 4.435            | 95.75%         | 0.19             | 0.24                  |
| 802.11ac MCS0/Nss1 VHT40 | 2.231        | 2.449            | 91.11%         | 0.40             | 0.45                  |
| 802.11ac MCS0/Nss1 VHT80 | 5.797        | 6.816            | 85.05%         | 0.70             | 0.17                  |

### 3.13. Test Configurations

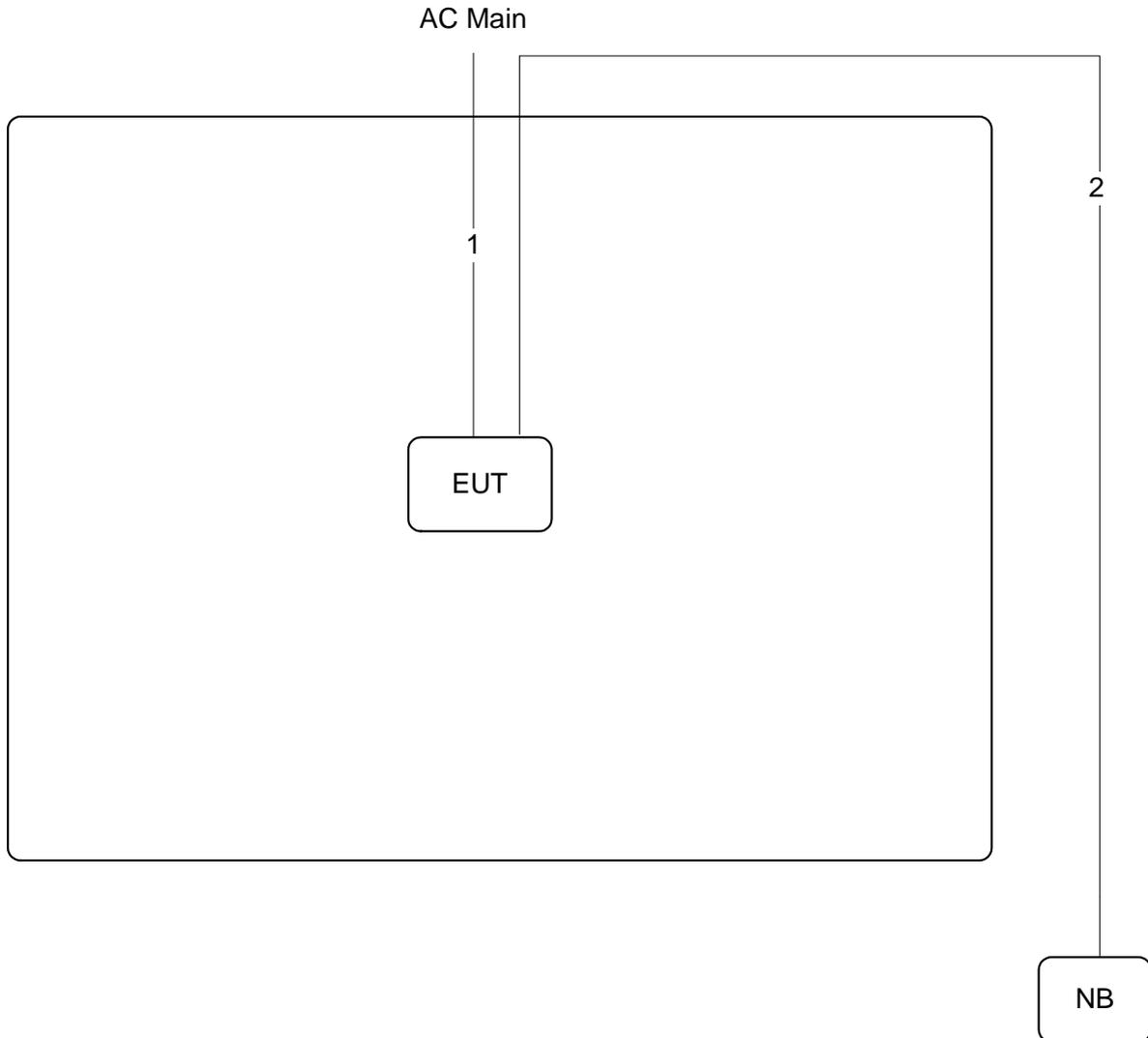
#### 3.13.1. AC Power Line Conduction Emissions Test Configuration



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power Cable | No       | 2.3m   |
| 2    | RJ-45 Cable | No       | 1.5m   |
| 3    | RJ-45 Cable | No       | 10m    |

### 3.13.2. Radiation Emissions Test Configuration

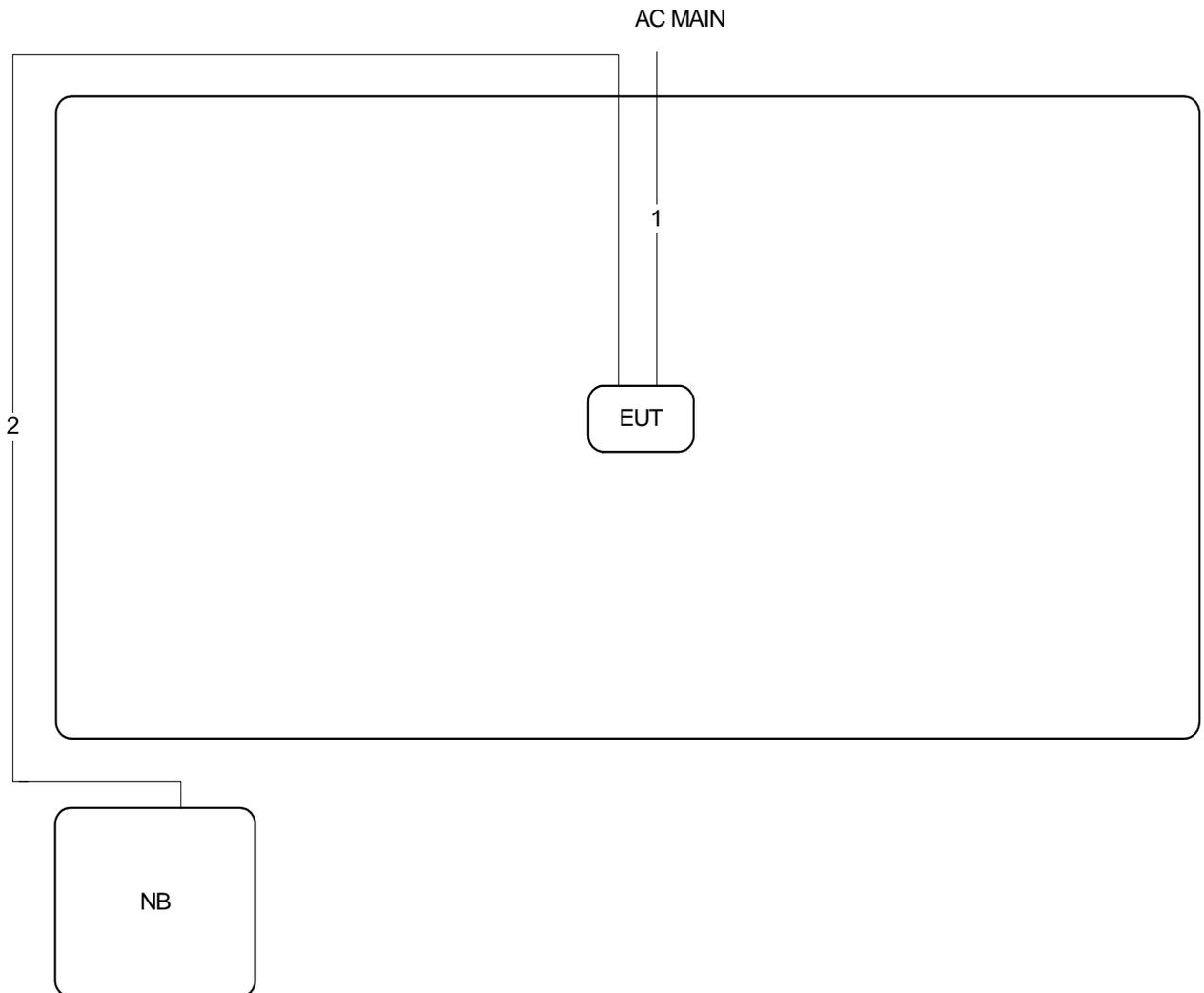
Test Configuration: 30MHz ~1GHz



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power Cable | No       | 2.3m   |
| 2    | RJ-45 Cable | No       | 10m    |

Test Configuration: above 1GHz

For Non-Beamforming Mode



| Item | Connection  | Shielded | Length |
|------|-------------|----------|--------|
| 1    | Power Cable | No       | 2.3m   |
| 2    | RJ-45 Cable | No       | 10m    |

## 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

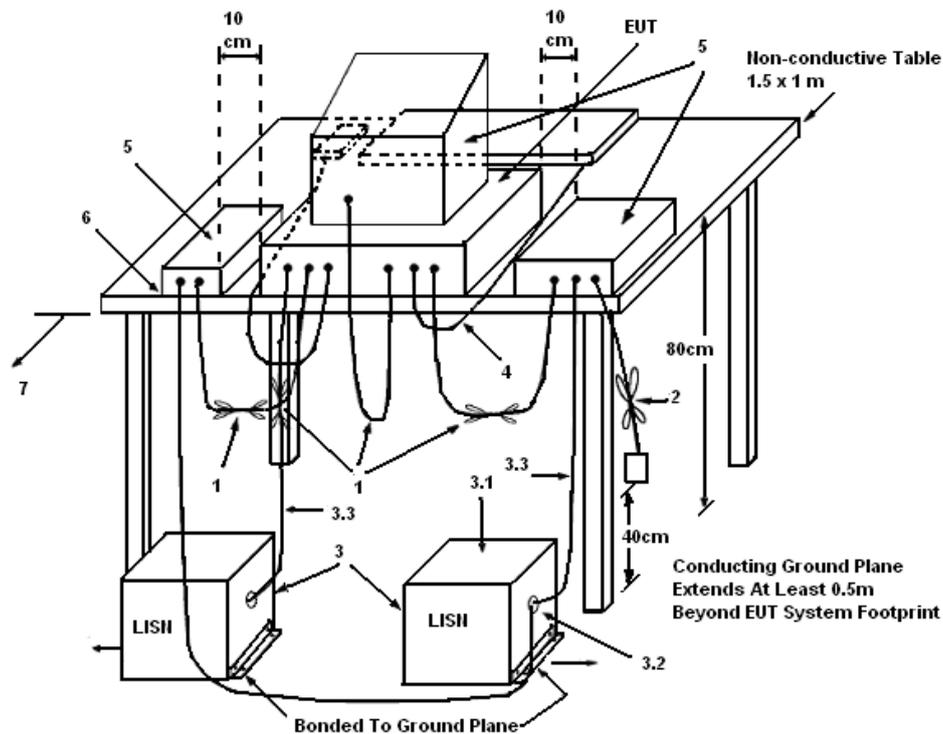
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

| 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.

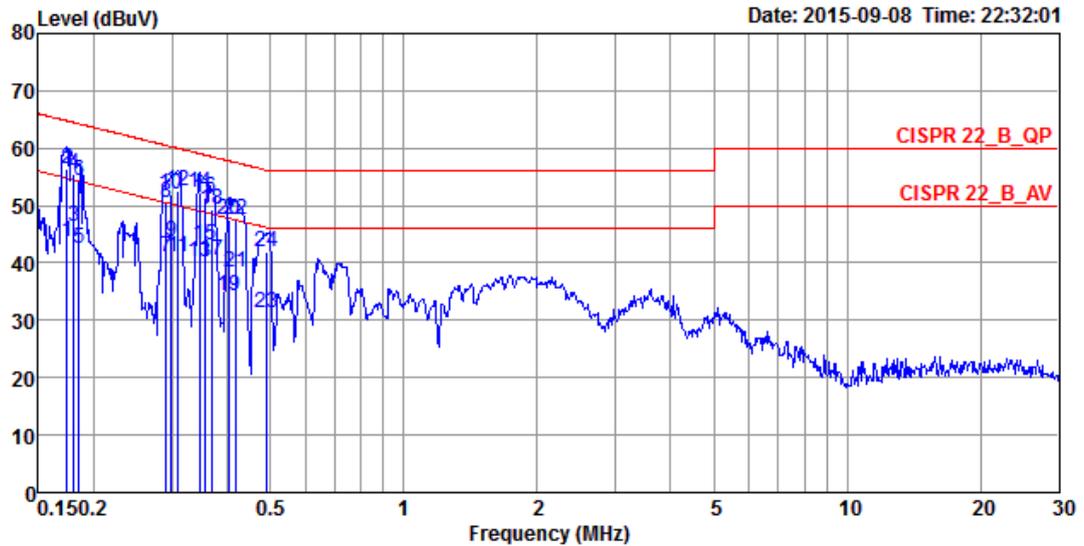
#### 4.1.6. EUT Operation during Test

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

4.1.7. Results of AC Power Line Conducted Emissions Measurement

For adding Adapter 4 ~ 6 test record

|               |              |          |      |
|---------------|--------------|----------|------|
| Temperature   | 25°C         | Humidity | 56%  |
| Test Engineer | Edison Lin   | Phase    | Line |
| Configuration | CTX / Mode 1 |          |      |

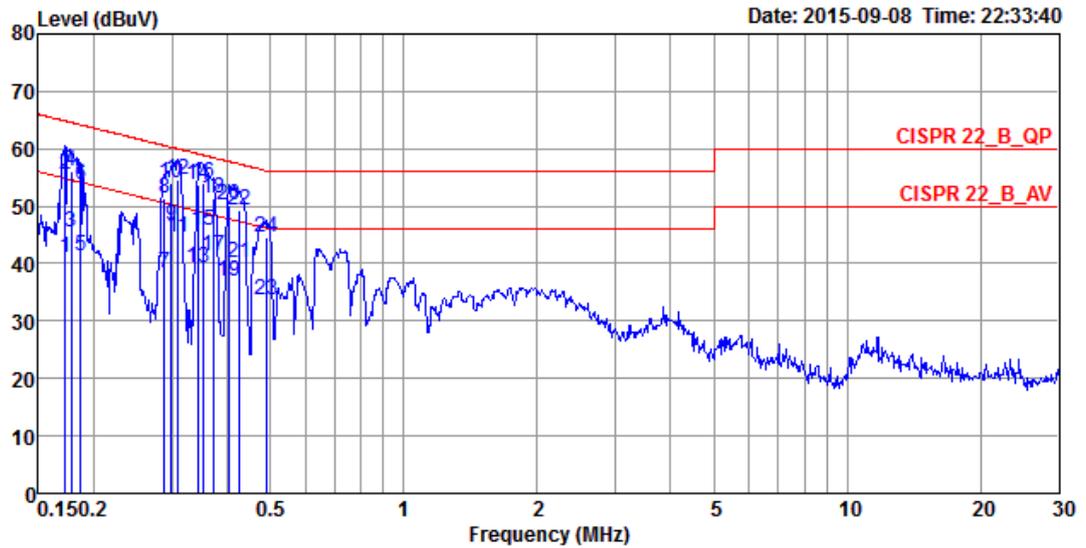


|    | Freq   | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Pol/Phase | Remark  |
|----|--------|-------|------------|------------|------------|-------------|------------|-----------|---------|
|    | MHz    | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |           |         |
| 1  | 0.1740 | 43.73 | -11.04     | 54.77      | 33.78      | 9.93        | 0.02       | LINE      | Average |
| 2  | 0.1740 | 56.35 | -8.42      | 64.77      | 46.40      | 9.93        | 0.02       | LINE      | QP      |
| 3  | 0.1806 | 46.34 | -8.12      | 54.46      | 36.39      | 9.93        | 0.02       | LINE      | Average |
| 4  | 0.1806 | 55.56 | -8.90      | 64.46      | 45.61      | 9.93        | 0.02       | LINE      | QP      |
| 5  | 0.1854 | 42.64 | -11.60     | 54.24      | 32.69      | 9.93        | 0.02       | LINE      | Average |
| 6  | 0.1854 | 54.20 | -10.04     | 64.24      | 44.25      | 9.93        | 0.02       | LINE      | QP      |
| 7  | 0.2909 | 40.91 | -9.59      | 50.50      | 30.94      | 9.93        | 0.04       | LINE      | Average |
| 8  | 0.2909 | 50.49 | -10.01     | 60.50      | 40.52      | 9.93        | 0.04       | LINE      | QP      |
| 9  | 0.2987 | 43.74 | -6.54      | 50.28      | 33.77      | 9.93        | 0.04       | LINE      | Average |
| 10 | 0.2987 | 52.04 | -8.24      | 60.28      | 42.07      | 9.93        | 0.04       | LINE      | QP      |
| 11 | 0.3100 | 41.15 | -8.82      | 49.97      | 31.18      | 9.93        | 0.04       | LINE      | Average |
| 12 | 0.3100 | 52.53 | -7.44      | 59.97      | 42.56      | 9.93        | 0.04       | LINE      | QP      |
| 13 | 0.3465 | 40.23 | -8.82      | 49.05      | 30.26      | 9.93        | 0.04       | LINE      | Average |
| 14 | 0.3465 | 52.30 | -6.75      | 59.05      | 42.33      | 9.93        | 0.04       | LINE      | QP      |
| 15 | 0.3577 | 43.12 | -5.66      | 48.78      | 33.15      | 9.93        | 0.04       | LINE      | Average |
| 16 | 0.3577 | 51.47 | -7.31      | 58.78      | 41.50      | 9.93        | 0.04       | LINE      | QP      |
| 17 | 0.3692 | 40.57 | -7.95      | 48.52      | 30.60      | 9.93        | 0.04       | LINE      | Average |



|    | Freq   | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Pol/Phase | Remark  |
|----|--------|-------|------------|------------|------------|-------------|------------|-----------|---------|
|    | MHz    | dBuV  | dB         | dBuV       | dBuV       | dB          | dB         |           |         |
| 18 | 0.3692 | 49.44 | -9.08      | 58.52      | 39.47      | 9.93        | 0.04       | LINE      | QP      |
| 19 | 0.4040 | 34.23 | -13.54     | 47.77      | 24.26      | 9.93        | 0.04       | LINE      | Average |
| 20 | 0.4040 | 47.54 | -10.23     | 57.77      | 37.57      | 9.93        | 0.04       | LINE      | QP      |
| 21 | 0.4171 | 38.47 | -9.04      | 47.51      | 28.50      | 9.93        | 0.04       | LINE      | Average |
| 22 | 0.4171 | 47.47 | -10.04     | 57.51      | 37.50      | 9.93        | 0.04       | LINE      | QP      |
| 23 | 0.4915 | 31.44 | -14.70     | 46.14      | 21.46      | 9.94        | 0.04       | LINE      | Average |
| 24 | 0.4915 | 41.94 | -14.20     | 56.14      | 31.96      | 9.94        | 0.04       | LINE      | QP      |

|               |              |          |         |
|---------------|--------------|----------|---------|
| Temperature   | 25°C         | Humidity | 56%     |
| Test Engineer | Edison Lin   | Phase    | Neutral |
| Configuration | CTX / Mode 1 |          |         |



|    | Freq   | Level | Over   | Limit | Read  | LISN   | Cable | Pol/Phase | Remark  |
|----|--------|-------|--------|-------|-------|--------|-------|-----------|---------|
|    | MHz    | dBuV  | Limit  | Line  | Level | Factor | Loss  |           |         |
|    |        |       | dB     | dBuV  | dBuV  | dB     | dB    |           |         |
| 1  | 0.1722 | 41.07 | -13.79 | 54.86 | 31.27 | 9.78   | 0.02  | NEUTRAL   | Average |
| 2  | 0.1722 | 55.44 | -9.42  | 64.86 | 45.64 | 9.78   | 0.02  | NEUTRAL   | QP      |
| 3  | 0.1777 | 45.55 | -9.04  | 54.59 | 35.74 | 9.79   | 0.02  | NEUTRAL   | Average |
| 4  | 0.1777 | 56.13 | -8.46  | 64.59 | 46.32 | 9.79   | 0.02  | NEUTRAL   | QP      |
| 5  | 0.1864 | 41.41 | -12.79 | 54.20 | 31.60 | 9.79   | 0.02  | NEUTRAL   | Average |
| 6  | 0.1864 | 53.68 | -10.52 | 64.20 | 43.87 | 9.79   | 0.02  | NEUTRAL   | QP      |
| 7  | 0.2878 | 38.52 | -12.07 | 50.59 | 28.69 | 9.79   | 0.04  | NEUTRAL   | Average |
| 8  | 0.2878 | 51.33 | -9.26  | 60.59 | 41.50 | 9.79   | 0.04  | NEUTRAL   | QP      |
| 9  | 0.2987 | 46.69 | -3.59  | 50.28 | 36.86 | 9.79   | 0.04  | NEUTRAL   | Average |
| 10 | 0.2987 | 54.02 | -6.26  | 60.28 | 44.19 | 9.79   | 0.04  | NEUTRAL   | QP      |
| 11 | 0.3100 | 44.64 | -5.33  | 49.97 | 34.81 | 9.79   | 0.04  | NEUTRAL   | Average |
| 12 | 0.3100 | 54.71 | -5.26  | 59.97 | 44.88 | 9.79   | 0.04  | NEUTRAL   | QP      |
| 13 | 0.3446 | 39.17 | -9.92  | 49.09 | 29.34 | 9.79   | 0.04  | NEUTRAL   | Average |
| 14 | 0.3446 | 53.75 | -5.34  | 59.09 | 43.92 | 9.79   | 0.04  | NEUTRAL   | QP      |
| 15 | 0.3539 | 45.66 | -3.21  | 48.87 | 35.83 | 9.79   | 0.04  | NEUTRAL   | Average |
| 16 | 0.3539 | 54.04 | -4.83  | 58.87 | 44.21 | 9.79   | 0.04  | NEUTRAL   | QP      |
| 17 | 0.3712 | 41.26 | -7.21  | 48.47 | 31.43 | 9.79   | 0.04  | NEUTRAL   | Average |



|    | Freq   | Level | Over<br>Limit | Limit<br>Line | Read<br>Level | LISN<br>Factor | Cable<br>Loss | Pol/Phase | Remark  |
|----|--------|-------|---------------|---------------|---------------|----------------|---------------|-----------|---------|
|    | MHz    | dBuV  | dB            | dBuV          | dBuV          | dB             | dB            |           |         |
| 18 | 0.3712 | 51.34 | -7.13         | 58.47         | 41.51         | 9.79           | 0.04          | NEUTRAL   | QP      |
| 19 | 0.4040 | 37.00 | -10.77        | 47.77         | 27.17         | 9.79           | 0.04          | NEUTRAL   | Average |
| 20 | 0.4040 | 50.18 | -7.59         | 57.77         | 40.35         | 9.79           | 0.04          | NEUTRAL   | QP      |
| 21 | 0.4237 | 40.15 | -7.22         | 47.37         | 30.32         | 9.79           | 0.04          | NEUTRAL   | Average |
| 22 | 0.4237 | 49.28 | -8.09         | 57.37         | 39.45         | 9.79           | 0.04          | NEUTRAL   | QP      |
| 23 | 0.4915 | 33.72 | -12.42        | 46.14         | 23.89         | 9.79           | 0.04          | NEUTRAL   | Average |
| 24 | 0.4915 | 44.47 | -11.67        | 56.14         | 34.64         | 9.79           | 0.04          | NEUTRAL   | QP      |

Note:

Level = Read Level + LISN Factor + Cable Loss

## 4.2. Radiated Emissions Measurement

### 4.2.1. Limit

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

In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies (MHz) | Field Strength (micovolts/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                             |

### 4.2.2. 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                             |

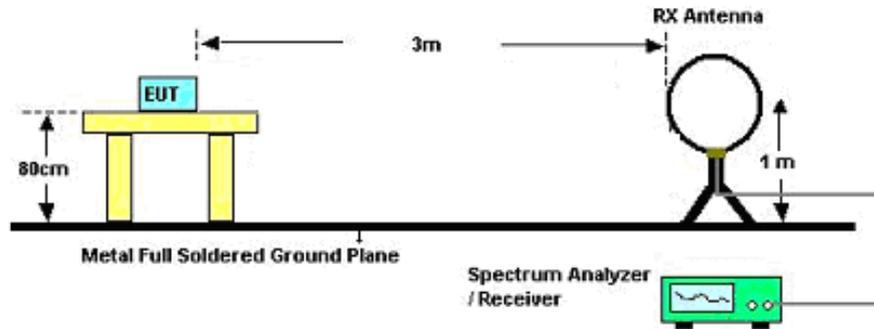
| Receiver Parameter     | Setting                           |
|------------------------|-----------------------------------|
| Attenuation            | Auto                              |
| Start ~ Stop Frequency | 9kHz~150kHz / RBW 200Hz for QP    |
| Start ~ Stop Frequency | 150kHz~30MHz / RBW 9kHz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

#### 4.2.3. Test Procedures

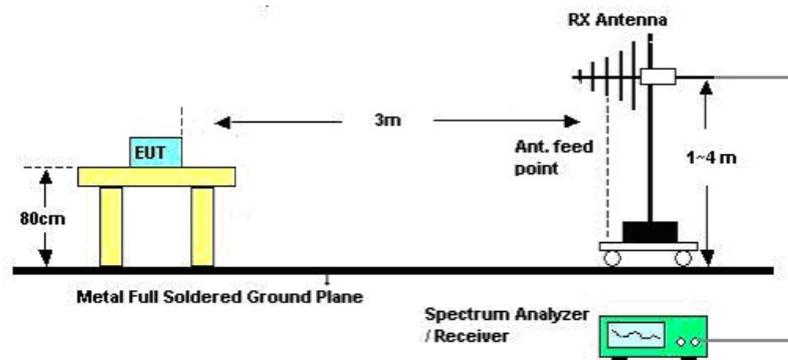
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting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

#### 4.2.4. Test Setup Layout

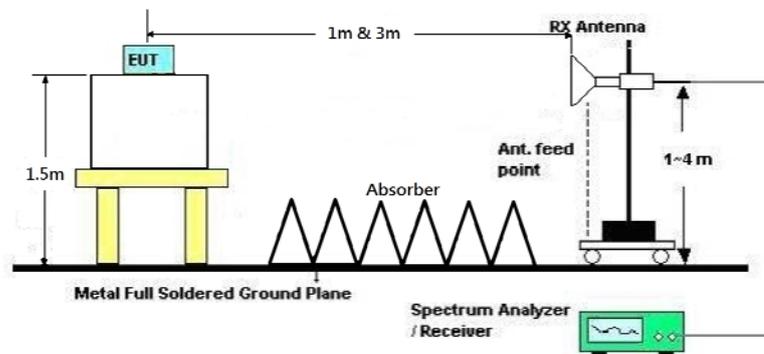
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



#### 4.2.5. Test Deviation

There is no deviation with the original standard.

#### 4.2.6. 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.

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

For adding Adapter 4 ~ 6 and Second Red, Black Heat sink test record

|               |               |                |              |
|---------------|---------------|----------------|--------------|
| Temperature   | 26°C          | Humidity       | 55%          |
| Test Engineer | Eric Fu       | Configurations | CTX / Mode 1 |
| Test Date     | Jul. 07, 2015 |                |              |

| 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 20 dB 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.

For EUT Rev 5.01 test record

|               |               |                |              |
|---------------|---------------|----------------|--------------|
| Temperature   | 24°C          | Humidity       | 55%          |
| Test Engineer | Gary Chu      | Configurations | CTX / Mode 2 |
| Test Date     | Aug. 25, 2015 |                |              |

| 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 20 dB below the permissible value has no need to be reported.

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

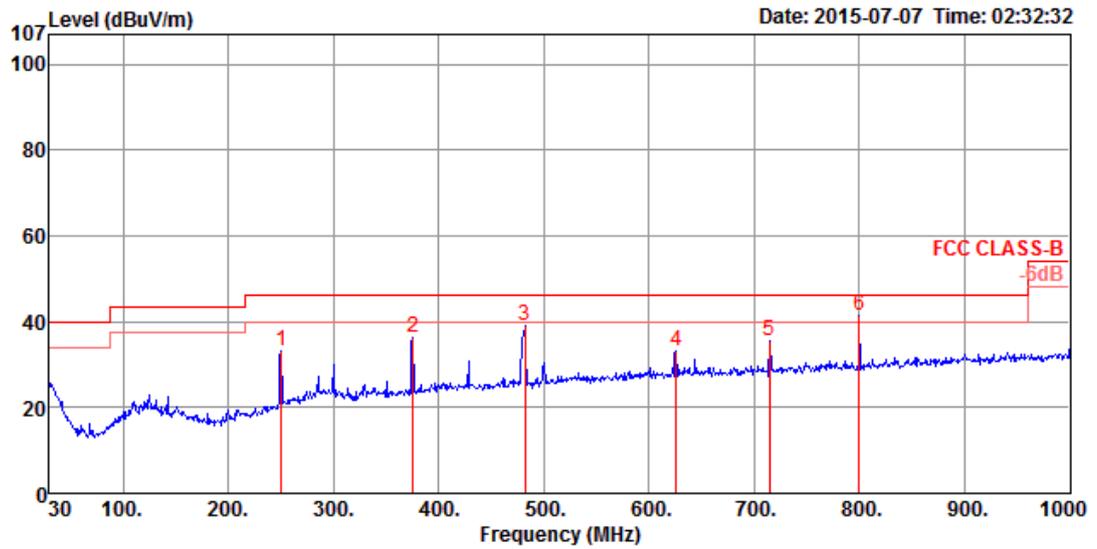
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

For adding Adapter 4 ~ 6 and Second Red, Black Heat sink test record

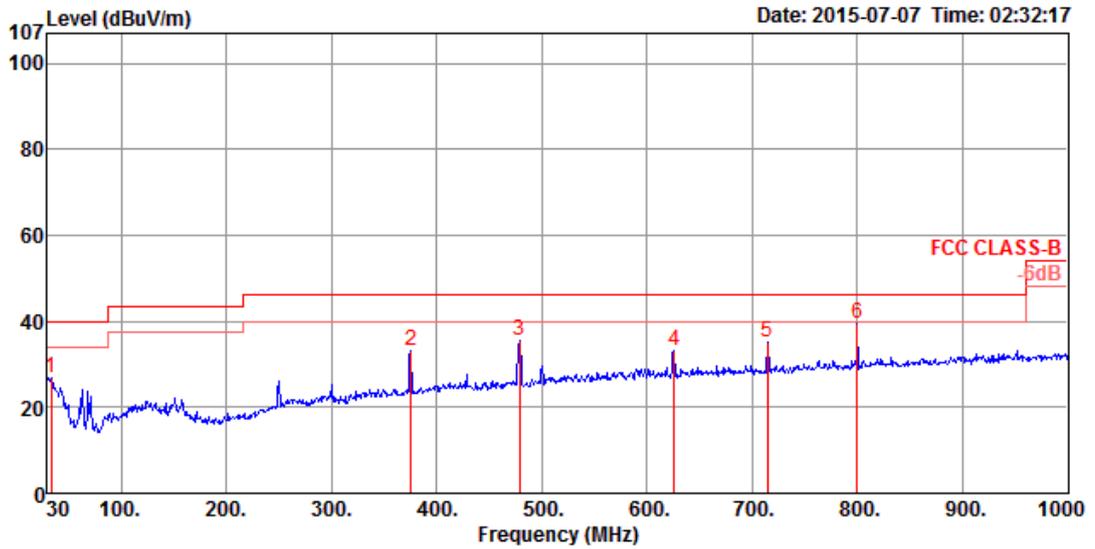
|               |         |                |              |
|---------------|---------|----------------|--------------|
| Temperature   | 26°C    | Humidity       | 55%          |
| Test Engineer | Eric Fu | Configurations | CTX / Mode 1 |

Horizontal



|   | Freq   | Level  | Limit Line | Over Limit | ReadAntenna Level | Cable Loss | Preamp Factor | A/Pos | T/Pos | Pol/Phase | Remark          |
|---|--------|--------|------------|------------|-------------------|------------|---------------|-------|-------|-----------|-----------------|
|   | MHz    | dBuV/m | dBuV/m     | dB         | dBuV              | dB/m       | dB            | cm    | deg   |           |                 |
| 1 | 250.19 | 33.26  | 46.00      | -12.74     | 51.22             | 13.00      | 1.57          | 32.53 | 150   | 189       | HORIZONTAL Peak |
| 2 | 375.32 | 36.39  | 46.00      | -9.61      | 51.07             | 15.93      | 1.93          | 32.54 | 100   | 185       | HORIZONTAL Peak |
| 3 | 482.02 | 39.01  | 46.00      | -6.99      | 51.87             | 17.57      | 2.17          | 32.60 | 100   | 100       | HORIZONTAL Peak |
| 4 | 625.58 | 33.14  | 46.00      | -12.86     | 44.09             | 19.26      | 2.46          | 32.67 | 150   | 211       | HORIZONTAL Peak |
| 5 | 714.82 | 35.73  | 46.00      | -10.27     | 45.80             | 19.85      | 2.64          | 32.56 | 150   | 121       | HORIZONTAL Peak |
| 6 | 800.18 | 41.32  | 46.00      | -4.68      | 50.30             | 20.60      | 2.81          | 32.39 | 125   | 219       | HORIZONTAL Peak |

**Vertical**



|   | Freq   | Level  | Limit Line | Over Limit | ReadAntenna Level | Cable Factor | Preamp Factor | A/Pos | T/Pos | Pol/Phase | Remark        |
|---|--------|--------|------------|------------|-------------------|--------------|---------------|-------|-------|-----------|---------------|
|   | MHz    | dBuV/m | dBuV/m     | dB         | dBuV              | dB/m         | dB            | dB    | cm    | deg       |               |
| 1 | 33.88  | 26.97  | 40.00      | -13.03     | 41.41             | 17.61        | 0.59          | 32.64 | 100   | 332       | VERTICAL Peak |
| 2 | 375.32 | 33.18  | 46.00      | -12.82     | 47.86             | 15.93        | 1.93          | 32.54 | 150   | 290       | VERTICAL Peak |
| 3 | 479.11 | 35.38  | 46.00      | -10.62     | 48.29             | 17.52        | 2.17          | 32.60 | 100   | 249       | VERTICAL Peak |
| 4 | 625.58 | 33.26  | 46.00      | -12.74     | 44.21             | 19.26        | 2.46          | 32.67 | 125   | 135       | VERTICAL Peak |
| 5 | 714.82 | 35.30  | 46.00      | -10.70     | 45.37             | 19.85        | 2.64          | 32.56 | 200   | 359       | VERTICAL Peak |
| 6 | 800.18 | 39.31  | 46.00      | -6.69      | 48.29             | 20.60        | 2.81          | 32.39 | 100   | 23        | VERTICAL Peak |

**Note:**

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

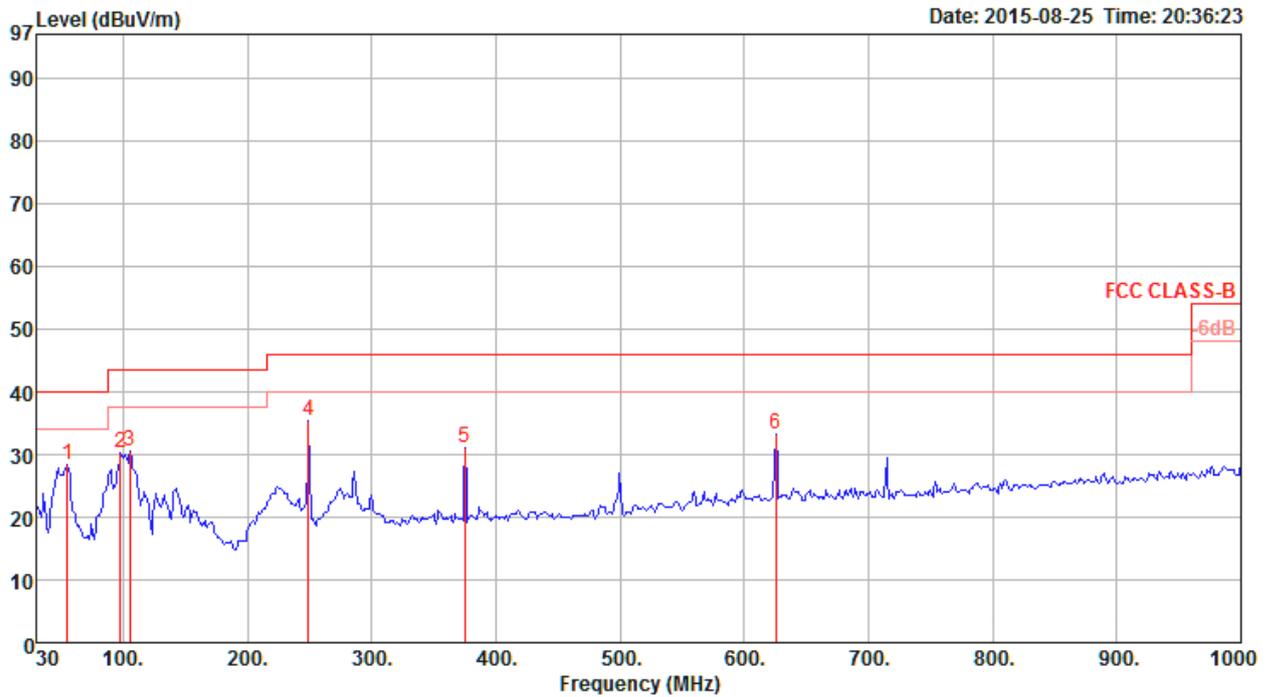
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

For EUT Rev 5.01 test record

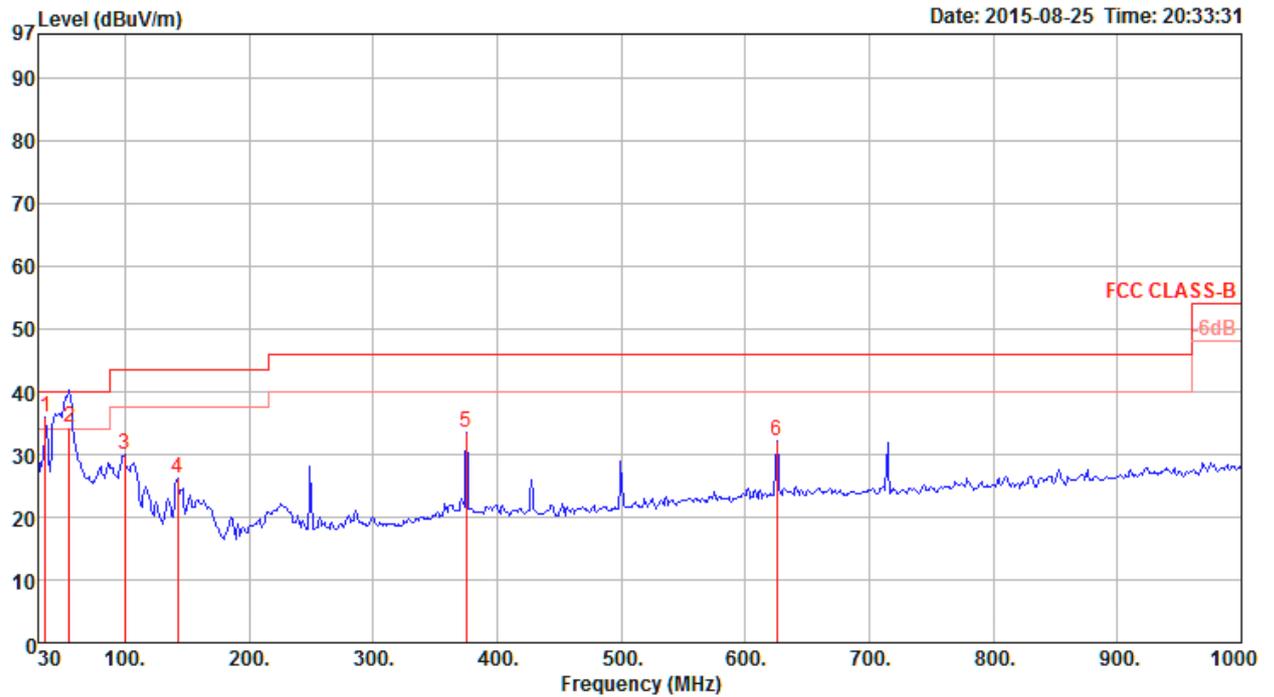
|               |          |                |              |
|---------------|----------|----------------|--------------|
| Temperature   | 24°C     | Humidity       | 55%          |
| Test Engineer | Gary Chu | Configurations | CTX / Mode 2 |

Horizontal



|   | Freq   | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp | T/Pos | A/Pos | Remark | Pol/Phase  |
|---|--------|--------|--------|--------|-------|-------|---------|--------|-------|-------|--------|------------|
|   | MHz    | dBuV/m | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     | deg   | cm    |        |            |
| 1 | 55.22  | 28.43  | 40.00  | -11.57 | 49.30 | 0.67  | 7.90    | 29.44  | 360   | 150   | Peak   | HORIZONTAL |
| 2 | 97.90  | 30.25  | 43.50  | -13.25 | 47.81 | 0.84  | 10.88   | 29.28  | 360   | 150   | Peak   | HORIZONTAL |
| 3 | 105.66 | 30.45  | 43.50  | -13.05 | 46.72 | 0.89  | 12.08   | 29.24  | 360   | 150   | Peak   | HORIZONTAL |
| 4 | 249.22 | 35.28  | 46.00  | -10.72 | 49.70 | 1.32  | 12.84   | 28.58  | 360   | 150   | Peak   | HORIZONTAL |
| 5 | 375.32 | 31.11  | 46.00  | -14.89 | 42.44 | 1.58  | 15.96   | 28.87  | 360   | 150   | Peak   | HORIZONTAL |
| 6 | 625.58 | 33.36  | 46.00  | -12.64 | 40.74 | 2.02  | 19.71   | 29.11  | 360   | 150   | Peak   | HORIZONTAL |

**Vertical**



|   | Freq   | Level  | Limit  | Over   | Read  | Cable | Antenna | Preamp | T/Pos | A/Pos | Remark | Pol/Phase |
|---|--------|--------|--------|--------|-------|-------|---------|--------|-------|-------|--------|-----------|
|   | MHz    | dBuV/m | dBuV/m | dB     | dBuV  | dB    | dB/m    | dB     | deg   | cm    |        |           |
| 1 | 35.82  | 35.91  | 40.00  | -4.09  | 48.62 | 0.61  | 16.18   | 29.50  | 0     | 150   | Peak   | VERTICAL  |
| 2 | 55.22  | 34.18  | 40.00  | -5.82  | 55.05 | 0.67  | 7.90    | 29.44  | 24    | 147   | QP     | VERTICAL  |
| 3 | 99.84  | 29.90  | 43.50  | -13.60 | 47.02 | 0.85  | 11.30   | 29.27  | 0     | 150   | Peak   | VERTICAL  |
| 4 | 142.52 | 26.25  | 43.50  | -17.25 | 42.47 | 1.01  | 11.85   | 29.08  | 0     | 150   | Peak   | VERTICAL  |
| 5 | 375.32 | 33.43  | 46.00  | -12.57 | 44.76 | 1.58  | 15.96   | 28.87  | 0     | 150   | Peak   | VERTICAL  |
| 6 | 625.58 | 32.20  | 46.00  | -13.80 | 39.58 | 2.02  | 19.71   | 29.11  | 0     | 150   | Peak   | 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.

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

For adding Second Red, Black Heat sink test record

For Non-Beamforming Mode

|                      |               |                       |  |
|----------------------|---------------|-----------------------|--|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 55%  |
| <b>Test Engineer</b> | Eric Fu       | <b>Configurations</b> | IEEE 802.11a CH 36 /<br>Chain1 + Chain 2 + Chain 3 + Chain 4 |
| <b>Test Date</b>     | Jul. 06, 2015 |                       |  |

##### Horizontal

|   | Freq     | Level  | Limit Line | Over Limit | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | A/Pos | T/Pos | Pol/Phase | Remark  |
|---|----------|--------|------------|------------|-------------------|----------------|------------|---------------|-------|-------|-----------|---------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV              | dB/m           | dB         | dB            | cm    | deg   |           |         |
| 1 | 15539.13 | 59.83  | 74.00      | -14.17     | 43.92             | 38.34          | 12.92      | 35.35         | 155   | 46    | VERTICAL  | Peak    |
| 2 | 15542.32 | 46.57  | 54.00      | -7.43      | 30.66             | 38.34          | 12.92      | 35.35         | 155   | 46    | VERTICAL  | Average |

##### Vertical

|   | Freq     | Level  | Limit Line | Over Limit | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | A/Pos | T/Pos | Pol/Phase  | Remark  |
|---|----------|--------|------------|------------|-------------------|----------------|------------|---------------|-------|-------|------------|---------|
|   | MHz      | dBuV/m | dBuV/m     | dB         | dBuV              | dB/m           | dB         | dB            | cm    | deg   |            |         |
| 1 | 15538.54 | 59.61  | 74.00      | -14.39     | 43.70             | 38.34          | 12.92      | 35.35         | 159   | 219   | HORIZONTAL | Peak    |
| 2 | 15540.25 | 46.58  | 54.00      | -7.42      | 30.67             | 38.34          | 12.92      | 35.35         | 159   | 219   | HORIZONTAL | Average |



|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 55%   |
| <b>Test Engineer</b> | Eric Fu       | <b>Configurations</b> | IEEE 802.11a CH 40 /<br>Chain 1 + Chain 2 + Chain 3 + Chain 4 |
| <b>Test Date</b>     | Jul. 06, 2015 |                       |   |

**Horizontal**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark             |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|--------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                    |
| 1 | 15599.16 | 59.98  | 74.00  | -14.02 | 44.11       | 38.27 | 12.96  | 35.36 | 162   | 81        | HORIZONTAL Peak    |
| 2 | 15600.52 | 46.21  | 54.00  | -7.79  | 30.40       | 38.21 | 12.96  | 35.36 | 162   | 81        | HORIZONTAL Average |

**Vertical**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark           |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                  |
| 1 | 15600.16 | 59.02  | 74.00  | -14.98 | 43.15       | 38.27 | 12.96  | 35.36 | 155   | 122       | VERTICAL Peak    |
| 2 | 15601.16 | 46.12  | 54.00  | -7.88  | 30.31       | 38.21 | 12.96  | 35.36 | 155   | 122       | VERTICAL Average |



|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 55%   |
| <b>Test Engineer</b> | Eric Fu       | <b>Configurations</b> | IEEE 802.11a CH 48 /<br>Chain 1 + Chain 2 + Chain 3 + Chain 4 |
| <b>Test Date</b>     | Jul. 06, 2015 |                       |   |

**Horizontal**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark             |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|--------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                    |
| 1 | 15719.16 | 46.67  | 54.00  | -7.33  | 30.94       | 38.08 | 13.03  | 35.38 | 158   | 245       | HORIZONTAL Average |
| 2 | 15720.15 | 59.84  | 74.00  | -14.16 | 44.11       | 38.08 | 13.03  | 35.38 | 158   | 245       | HORIZONTAL Peak    |

**Vertical**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark           |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                  |
| 1 | 15719.49 | 59.72  | 74.00  | -14.28 | 43.99       | 38.08 | 13.03  | 35.38 | 148   | 311       | VERTICAL Peak    |
| 2 | 15720.19 | 46.44  | 54.00  | -7.56  | 30.71       | 38.08 | 13.03  | 35.38 | 148   | 311       | VERTICAL Average |



|                      |               |                       |   |
|----------------------|---------------|-----------------------|---|
| <b>Temperature</b>   | 26°C          | <b>Humidity</b>       | 55%   |
| <b>Test Engineer</b> | Eric Fu       | <b>Configurations</b> | IEEE 802.11ac MCS0/Nss4 VHT40 CH 38 / Chain 1 + Chain 2 + Chain 3 + Chain 4 |
| <b>Test Date</b>     | Jul. 07, 2015 |                       |   |

**Horizontal**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark             |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|--------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                    |
| 1 | 15570.43 | 59.28  | 74.00  | -14.72 | 43.43       | 38.27 | 12.94  | 35.36 | 152   | 124       | HORIZONTAL Peak    |
| 2 | 15570.82 | 46.19  | 54.00  | -7.81  | 30.34       | 38.27 | 12.94  | 35.36 | 152   | 124       | HORIZONTAL Average |

**Vertical**

|   | Freq     | Level  | Limit  | Over   | ReadAntenna | Cable | Preamp | A/Pos | T/Pos | Pol/Phase | Remark           |
|---|----------|--------|--------|--------|-------------|-------|--------|-------|-------|-----------|------------------|
|   | MHz      | dBuV/m | dBuV/m | dB     | dBuV        | dB/m  | dB     | dB    | cm    | deg       |                  |
| 1 | 15569.14 | 59.12  | 74.00  | -14.88 | 43.27       | 38.27 | 12.94  | 35.36 | 197   | 284       | VERTICAL Peak    |
| 2 | 15570.36 | 46.28  | 54.00  | -7.72  | 30.43       | 38.27 | 12.94  | 35.36 | 197   | 284       | VERTICAL Average |

**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.

### **4.3. Antenna Requirements**

#### **4.3.1. 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.

#### **4.3.2. Antenna Connector Construction**

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

## 5. LIST OF MEASURING EQUIPMENTS

For adding Adapter 4 ~ 6 and Second Red, Black Heat sink test record

| Instrument        | Manufacturer | Model No.        | Serial No.  | Characteristics | Calibration Date | Remark                |
|-------------------|--------------|------------------|-------------|-----------------|------------------|-----------------------|
| EMI Test Receiver | R&S          | ESCS 30          | 100355      | 9kHz ~ 2.75GHz  | Apr. 22, 2015    | Conduction (CO01-CB)  |
| LISN              | F.C.C.       | FCC-LISN-50-16-2 | 04083       | 150kHz ~ 100MHz | Dec. 02, 2014    | Conduction (CO01-CB)  |
| LISN              | Schwarzbeck  | NSLK 8127        | 8127647     | 9kHz ~ 30MHz    | Dec. 02, 2014    | Conduction (CO01-CB)  |
| COND Cable        | Woken        | Cable            | 01          | 150kHz ~ 30MHz  | Dec. 03, 2014    | Conduction (CO01-CB)  |
| Software          | Audix        | E3               | 5.410e      | -               | N.C.R.           | Conduction (CO01-CB)  |
| BILOG ANTENNA     | Schaffner    | CBL6112D         | 22021       | 20MHz ~ 2GHz    | May 06, 2015     | Radiation (03CH01-CB) |
| Horn Antenna      | EMCO         | 3115             | 00075790    | 750MHz ~ 18GHz  | Oct. 28, 2014    | Radiation (03CH01-CB) |
| Horn Antenna      | Schwarzbeck  | BBHA 9170        | BBHA9170252 | 15GHz ~ 40GHz   | Aug. 22, 2014    | Radiation (03CH01-CB) |
| Pre-Amplifier     | Agilent      | 8447D            | 2944A10991  | 0.1MHz ~ 1.3GHz | Feb. 24, 2015    | Radiation (03CH01-CB) |
| Pre-Amplifier     | Agilent      | 8449B            | 3008A02310  | 1GHz ~ 26.5GHz  | Jan. 12, 2015    | Radiation (03CH01-CB) |
| Pre-Amplifier     | WM           | TF-130N-R1       | 923365      | 26GHz ~ 40GHz   | Nov. 25, 2014    | Radiation (03CH01-CB) |
| Spectrum Analyzer | R&S          | FSP40            | 100056      | 9kHz ~ 40GHz    | Nov. 06, 2014    | Radiation (03CH01-CB) |
| EMI Receiver      | Agilent      | N9038A           | MY52260123  | 9kHz ~ 8.4GHz   | Jan. 21, 2015    | Radiation (03CH01-CB) |
| RF Cable-low      | Woken        | Low Cable-1      | N/A         | 30 MHz ~ 1 GHz  | Nov. 15, 2014    | Radiation (03CH01-CB) |
| RF Cable-high     | Woken        | High Cable-40G-1 | N/A         | 1 GHz ~ 40 GHz  | Nov. 15, 2014    | Radiation (03CH01-CB) |
| RF Cable-high     | Woken        | High Cable-40G-2 | N/A         | 1 GHz ~ 40 GHz  | Nov. 15, 2014    | Radiation (03CH01-CB) |
| Loop Antenna      | Teseq        | HLA 6120         | 24155       | 9kHz - 30 MHz   | Mar. 12, 2015*   | Radiation (03CH01-CB) |

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

\*Calibration Interval of instruments listed above is two year.

N.C.R. means Non-Calibration required.

**For EUT Rev 5.01 test record**

| Instrument        | Manufacturer | Model No.   | Serial No. | Characteristics | Calibration Date | Remark                |
|-------------------|--------------|-------------|------------|-----------------|------------------|-----------------------|
| BILOG ANTENNA     | Schaffner    | CBL6112D    | 22021      | 20MHz ~ 2GHz    | May 06, 2015     | Radiation (03CH01-CB) |
| Horn Antenna      | EMCO         | 3115        | 00075790   | 750MHz ~ 18GHz  | Oct. 28, 2014    | Radiation (03CH01-CB) |
| Pre-Amplifier     | Agilent      | 8447D       | 2944A10991 | 0.1MHz ~ 1.3GHz | Feb. 24, 2015    | Radiation (03CH01-CB) |
| Pre-Amplifier     | Agilent      | 8449B       | 3008A02310 | 1GHz ~ 26.5GHz  | Jan. 12, 2015    | Radiation (03CH01-CB) |
| Spectrum Analyzer | R&S          | FSP40       | 100056     | 9kHz ~ 40GHz    | Nov. 06, 2014    | Radiation (03CH01-CB) |
| EMI Receiver      | Agilent      | N9038A      | MY52260123 | 9kHz ~ 8.4GHz   | Jan. 21, 2015    | Radiation (03CH01-CB) |
| RF Cable-low      | Woken        | Low Cable-1 | N/A        | 30 MHz ~ 1 GHz  | Nov. 15, 2014    | Radiation (03CH01-CB) |
| Loop Antenna      | Teseq        | HLA 6120    | 24155      | 9kHz - 30 MHz   | Mar. 12, 2015*   | Radiation (03CH01-CB) |

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

\*Calibration Interval of instruments listed above is two year.

## 6. MEASUREMENT UNCERTAINTY

| Test Items                           | Uncertainty | Remark                   |
|--------------------------------------|-------------|--------------------------|
| Conducted Emission (150kHz ~ 30MHz)  | 2.4 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% |