

## FCC Test Report (WLAN)

**Report No.:** RF140808E04B

**FCC ID:** PPD-QCNFA324

**Test Model:** QCNFA324

**Received Date:** Mar. 06, 2015

**Test Date:** May 08 to 13, 2015

**Issued Date:** May 18, 2015

**Applicant:** Qualcomm Atheros, Inc.

**Address:** 1700 Technology Drive, San Jose, CA 95110

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
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### Release Control Record

| Issue No.    | Description       | Date Issued  |
|--------------|-------------------|--------------|
| RF140808E04B | Original release. | May 18, 2015 |



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# 1 Certificate of Conformity

**Product:** 2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module

**Brand:** Qualcomm Atheros

**Test Model:** QCNFA324

**Sample Status:** R&D SAMPLE

**Applicant:** Qualcomm Atheros, Inc.

**Test Date:** May 08 to 13, 2015

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2009

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Phoenix Huang , **Date:** May 18, 2015  
Phoenix Huang / Specialist

**Approved by :** May Chen , **Date:** May 18, 2015  
May Chen / Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (SECTION 15.247) |                                              |        |                                                                                    |
|------------------------------------------------|----------------------------------------------|--------|------------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                                    | Result | Remarks                                                                            |
| 15.207                                         | AC Power Conducted Emission                  | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -8.38dB at 0.19687MHz. |
| 15.205 /<br>15.209 /<br>15.247(d)              | Radiated Emissions and Band Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -0.7dB at 7386.00MHz   |
| 15.247(b)                                      | Conducted power                              | PASS   | Meet the requirement of limit.                                                     |
| 15.203                                         | Antenna Requirement                          | PASS   | Antenna connector is IPEX not a standard connector.                                |

- NOTE:** 1. For WLAN: The EUT was operating in 2.4 ~ 2.4835GHz, 5.15~5.35GHz, 5.47~5.725GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 2.4 ~ 2.4835GHz. For the 5.15~5.35GHz, 5.47~5.725GHz and 5.725~5.850GHz RF parameters was recorded in another test report.
2. This report is prepared for FCC Class II change. (Only AC Power Conducted Emission, Radiated Emissions and Band Edge and Conducted power Measurement were presented in this test report).

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement                        | Frequency      | Expanded Uncertainty (k=2) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.86 dB                        |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1GHz   | 5.37 dB                        |
| Radiated Emissions above 1 GHz     | 1GHz ~ 6GHz    | 3.72 dB                        |
|                                    | 6GHz ~ 18GHz   | 4.00 dB                        |
|                                    | 18GHz ~ 40GHz  | 4.11 dB                        |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (WLAN)

|                       |                                                                                                                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product               | 2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module                                                                                                                                                                                |
| Brand                 | Qualcomm Atheros                                                                                                                                                                                                            |
| Test Model            | QCNFA324                                                                                                                                                                                                                    |
| Status of EUT         | R&D SAMPLE                                                                                                                                                                                                                  |
| Power Supply Rating   | 3.3Vdc form host equipment                                                                                                                                                                                                  |
| Modulation Type       | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz                                                                                              |
| Modulation Technology | DSSS, OFDM                                                                                                                                                                                                                  |
| Transfer Rate         | 802.11b: up to 11Mbps<br>802.11a/g: up to 54Mbps<br>802.11n : up to 300Mbps<br>802.11ac: up to 866.7Mbps                                                                                                                    |
| Operating Frequency   | For 15.407<br>5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.5~5.72GHz, 5.745 ~ 5.825GHz<br>For 15.247<br>2.412 ~ 2.472GHz                                                                                                               |
| Number of Channel     | For 15.407<br>25 for 802.11a, 802.11n (HT20), VHT20<br>12 for 802.11n (HT40), VHT40<br>6 for 802.11ac (VHT80)<br>For 15.247<br>13 for 802.11b/g, 802.11n (HT20), VHT20<br>9 for 802.11n (HT40), VHT40                       |
| Output Power          | For 15.407<br>802.11a: 77.033mW<br>802.11ac (VHT20): 63.586mW<br>802.11ac (VHT40): 47.366mW<br>802.11ac (VHT80): 43.894mW<br>For 15.247<br>802.11b: 241.545mW<br>802.11g: 460.432mW<br>VHT20: 469.401mW<br>VHT40: 204.747mW |
| Antenna Type          | See item 3.2                                                                                                                                                                                                                |
| Antenna Connector     | See item 3.2                                                                                                                                                                                                                |
| Accessory Device      | NA                                                                                                                                                                                                                          |
| Data Cable Supplied   | NA                                                                                                                                                                                                                          |

# Note:

- This report is prepared for FCC class II change. The difference compared with the Report No.: RF140808E04 design is as the following information:
  - Minor PCB layout change for DC power trace for GPIO Power domain.
  - Chip revision. New chip is pin to pin compatible.
  - BOM change to RF matching.
- According to above conditions, only AC Power Conducted Emission, Radiated Emissions and Band Edge and Conducted power need to be performed. And all data was verified to meet the requirements.
- There are Bluetooth technology and WLAN technology used for the EUT.
- WLAN <5GHz> and Bluetooth technology can transmit at same time.
- QCNFA324 supports two digital interfaces (USB and UART) for Bluetooth digital end data communication. The Bluetooth RF end is exactly same in both implementations.

| Variant No.                                                                                                                 | Interface             |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------|
| SKU #1                                                                                                                      | USB interface for BT  |
| SKU #2                                                                                                                      | UART interface for BT |
| From the above Variants, SKU #1 was selected as representative model for the test and its data was recorded in this report. |                       |

- The EUT incorporates a 2T2R function with beamforming.

| For 2.4G Band                             |                 |                       |     |
|-------------------------------------------|-----------------|-----------------------|-----|
| MODULATION MODE                           | DATA RATE (MCS) | TX & RX CONFIGURATION |     |
| 802.11b                                   | 1 ~ 11Mbps      | 2TX                   | 2RX |
| 802.11g                                   | 6 ~ 54Mbps      | 2TX                   | 2RX |
| 802.11n (HT20)<br>&<br>802.11n (HT40)     | MCS 0~7         | 2TX                   | 2RX |
|                                           | MCS 8~15        | 2TX                   | 2RX |
| VHT20                                     | MCS0~8 Nss=1    | 2TX                   | 2RX |
|                                           | MCS0~8 Nss=2    | 2TX                   | 2RX |
| VHT40                                     | MCS0~9 Nss=1    | 2TX                   | 2RX |
|                                           | MCS0~9 Nss=2    | 2TX                   | 2RX |
| For 5G Band                               |                 |                       |     |
| 802.11a                                   | 6 ~ 54Mbps      | 2TX                   | 2RX |
| 802.11n (HT20)<br>&<br>802.11n (HT40)     | MCS 0~7         | 2TX                   | 2RX |
|                                           | MCS 8~15        | 2TX                   | 2RX |
| 802.11ac (VHT20)                          | MCS0~8 Nss=1    | 2TX                   | 2RX |
|                                           | MCS0~8 Nss=2    | 2TX                   | 2RX |
| 802.11ac (VHT40)<br>&<br>802.11ac (VHT80) | MCS0~9 Nss=1    | 2TX                   | 2RX |
|                                           | MCS0~9 Nss=2    | 2TX                   | 2RX |

7. The EUT was pre-tested under the following modes:

| Test Mode     | Data rate       |
|---------------|-----------------|
| Mode A        | 400ns GI        |
| <b>Mode B</b> | <b>800ns GI</b> |

From the above modes, the worst case was found in **Mode B**. Therefore only the test data of the mode was recorded in this report.

8. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 Description of Antenna

The antenna gain was declared by client; please refer to the following table:

| Antenna set 1       |        |                         |              |                                   |                                                   |                         |                                               |                |                   |
|---------------------|--------|-------------------------|--------------|-----------------------------------|---------------------------------------------------|-------------------------|-----------------------------------------------|----------------|-------------------|
| Transmitter Circuit | Brand  | Model                   | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi)                   | 2.4GHz Cable Loss (dBi) | 5G Cable Loss (dBi)                           | Connector Type | Cable Length (mm) |
| Chain (0)           | WNC    | 81-EBJ15.005            | PIFA         | 3.62                              | Band 1&2: 3.08<br>Band 3: 4.76<br>Band 4: 4.76    | 1.15                    | Band 1&2:1.70<br>Band 3: 1.74<br>Band 4: 1.79 | IPEX           | 300               |
| Chain (1)           | WNC    | 81-EBJ15.005            | PIFA         | 3.62                              | Band 1&2: 3.08<br>Band 3: 4.76<br>Band 4: 4.76    | 1.15                    | Band 1&2:1.70<br>Band 3: 1.74<br>Band 4: 1.79 | IPEX           | 300               |
| Antenna set 2       |        |                         |              |                                   |                                                   |                         |                                               |                |                   |
| Transmitter Circuit | Brand  | Model                   | Antenna Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi)                   | Cable Loss (dBi)        |                                               | Connector Type | Cable Length (mm) |
| Chain (0)           | Tongda | T-543-8201044-A (Ant 1) | PIFA         | 3.572                             | Band 1&2: 3.002<br>Band 3: 4.546<br>Band 4: 4.416 | NA                      |                                               | IPEX           | 77                |
| Chain (1)           | Tongda | T-543-8201044-A (Ant 2) | PIFA         | 3.325                             | Band 1&2: 2.942<br>Band 3: 4.622<br>Band 4: 4.586 | NA                      |                                               | IPEX           | 71                |

- Note: 1. Above antenna gains of antenna are Total (H+V).  
2. All of antenna can be application for WLAN and Bluetooth.

### 3.3 Description of Test Modes

13 channels are provided for 802.11b, 802.11g and 802.11n (HT20), VHT20:

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 1       | 2412MHz   | 8       | 2447MHz   |
| 2       | 2417MHz   | 9       | 2452MHz   |
| 3       | 2422MHz   | 10      | 2457MHz   |
| 4       | 2427MHz   | 11      | 2462MHz   |
| 5       | 2432MHz   | 12      | 2467MHz   |
| 6       | 2437MHz   | 13      | 2472MHz   |
| 7       | 2442MHz   |         |           |

9 channels are provided for 802.11n (HT40), VHT40:

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 3       | 2422MHz   | 8       | 2447MHz   |
| 4       | 2427MHz   | 9       | 2452MHz   |
| 5       | 2432MHz   | 10      | 2457MHz   |
| 6       | 2437MHz   | 11      | 2462MHz   |
| 7       | 2442MHz   |         |           |

### 3.3.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO |       |     |      | DESCRIPTION |
|--------------------|---------------|-------|-----|------|-------------|
|                    | RE≥1G         | RE<1G | PLC | APCM |             |
| -                  | √             | √     | √   | √    | -           |

Where **RE≥1G**: Radiated Emission above 1GHz & Bandedge Measurement

**RE<1G**: Radiated Emission below 1GHz

**PLC**: Power Line Conducted Emission

**APCM**: Antenna Port Conducted Measurement

Note: The EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane.

#### **Radiated Emission Test (Above 1GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE    | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|---------|-------------------|----------------|-----------------------|------------------|
| 802.11b | 1 to 13           | 1, 6, 11       | DSSS                  | 1                |
| 802.11g | 1 to 13           | 1, 6, 11       | OFDM                  | 6                |
| VHT20   | 1 to 13           | 1, 6, 11       | OFDM                  | 6.5              |
| VHT40   | 3 to 11           | 3, 6, 9        | OFDM                  | 13.5             |

#### **Radiated Emission Test (Below 1GHz):**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE    | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|---------|-------------------|----------------|-----------------------|------------------|
| 802.11g | 1 to 13           | 6              | OFDM                  | 6                |

#### **Power Line Conducted Emission Test:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE    | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|---------|-------------------|----------------|-----------------------|------------------|
| 802.11g | 1 to 13           | 6              | OFDM                  | 6                |

### **Antenna Port Conducted Measurement:**

- ☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE    | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|---------|-------------------|----------------|-----------------------|------------------|
| 802.11b | 1 to 13           | 1, 6, 11       | DSSS                  | 1                |
| 802.11g | 1 to 13           | 1, 6, 11       | OFDM                  | 6                |
| VHT20   | 1 to 13           | 1, 6, 11       | OFDM                  | 6.5              |
| VHT40   | 3 to 11           | 3, 6, 9        | OFDM                  | 13.5             |

### **Test Condition:**

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY    |
|---------------|--------------------------|----------------------|--------------|
| RE $\geq$ 1G  | 24deg. C, 71%RH          | 120Vac, 60Hz         | Gary Cheng   |
| RE<1G         | 23deg. C, 68%RH          | 120Vac, 60Hz         | Robert Cheng |
| PLC           | 25deg. C, 70%RH          | 120Vac, 60Hz         | Mike Hsieh   |
| APCM          | 25deg. C, 60%RH          | 120Vac, 60Hz         | Andy Ho      |

### 3.4 Duty Cycle of Test Signal

Duty cycle of test signal is < 98%, duty factor shall be considered.

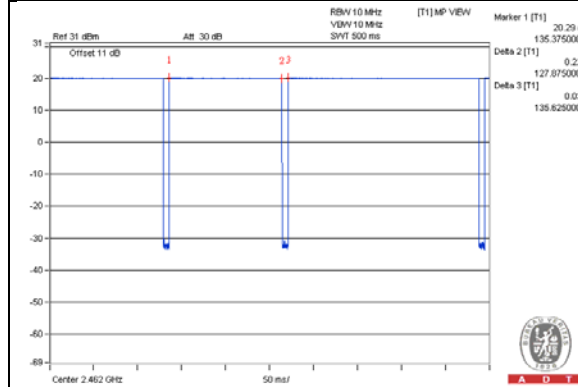
**802.11b:** Duty cycle = 127.875 ms/135.625 ms = 0.943, Duty factor =  $10 * \log(1/0.943) = 0.25$

**802.11g:** Duty cycle = 21.4 ms/28.4 ms = 0.754, Duty factor =  $10 * \log(1/0.754) = 1.2$

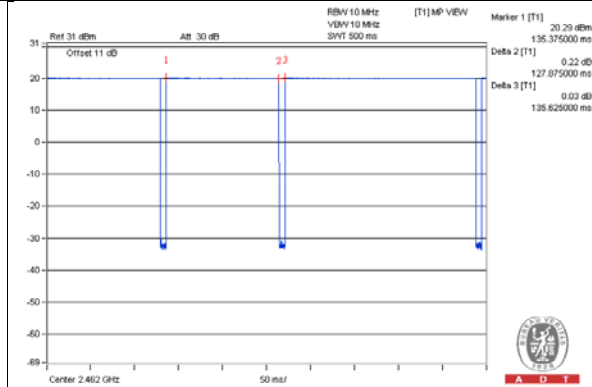
**VHT20:** Duty cycle = 19.7 ms/26.7 ms = 0.738, Duty factor =  $10 * \log(1/0.738) = 1.3$

**VHT40:** Duty cycle = 9.512 ms/16.512 ms = 0.576, Duty factor =  $10 * \log(1/0.576) = 2.4$

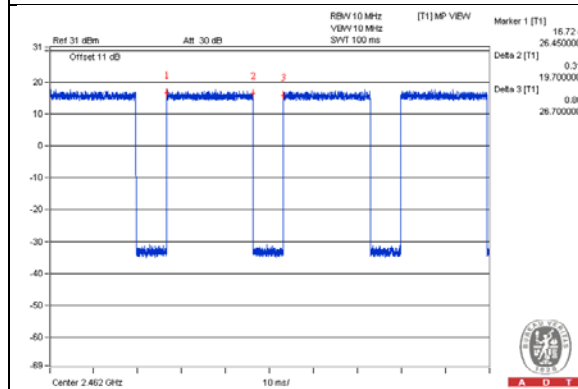
#### 802.11b



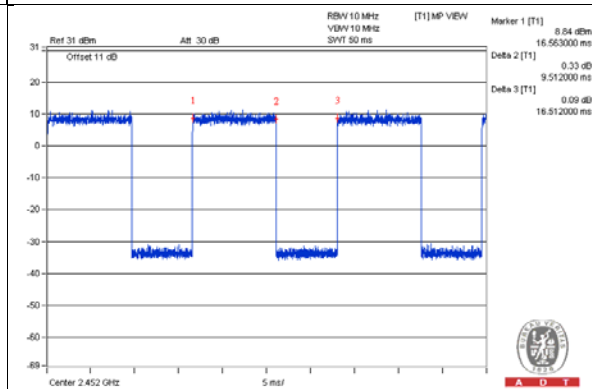
#### 802.11g



#### VHT20



#### VHT40



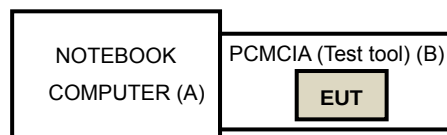
### 3.5 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| No. | Product            | Brand            | Model No. | Serial No. | FCC ID  | Remark             |
|-----|--------------------|------------------|-----------|------------|---------|--------------------|
| A   | NOTEBOOK COMPUTER  | DELL             | E6420     | H62T3R1    | FCC DoC | Provided by Lab    |
| B   | PCMCIA (Test tool) | Qualcomm Atheros | NA        | NA         | NA      | Supplied by Client |

**NOTE:** All power cords of the above support units are non-shielded (1.8 m).

#### 3.5.1 Configuration of System under Test



### 3.6 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.247)**

**558074 D01 DTS Meas Guidance v03r02**

**662911 D01 Multiple Transmitter Output v02r01**

**ANSI C63.10-2009**

All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Conducted Output Power Measurement

#### 4.1.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

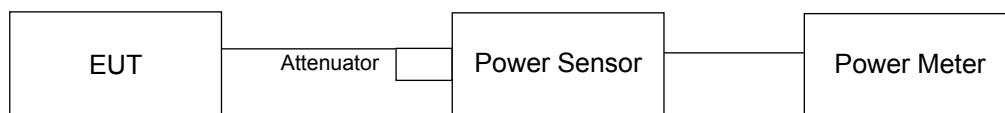
Array Gain = 0 dB (i.e., no array gain) for  $NANT \leq 4$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any NANT;

Array Gain =  $5 \log(NANT/NSS)$  dB or 3 dB, whichever is less for 20-MHz channel widths with  $NANT \geq 5$ .

For power measurements on all other devices: Array Gain =  $10 \log(NANT/NSS)$  dB.

#### 4.1.2 Test Setup



#### 4.1.3 Test Instruments

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| Power meter<br>Anritsu     | ML2495A   | 0824006    | May 22, 2014    | May 21, 2015     |
| Power sensor<br>Anritsu    | MA2411B   | 0738172    | May 22, 2014    | May 21, 2015     |

#### Note:

- The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
- Tested date : May 13, 2015

#### 4.1.4 Test Procedures

The peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the power level.

#### 4.1.5 Deviation from Test Standard

No deviation.

#### 4.1.6 EUT Operating Conditions

The software (QCRT Version: 3.0.29.0) provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.1.7 Test Results

##### FOR PEAK POWER

##### 802.11b

| Chan. | Chan. Freq. (MHz) | Peak Power (dBm) |         | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|-------|-------------------|------------------|---------|------------------|-------------------|-------------|-------------|
|       |                   | Chain 0          | Chain 1 |                  |                   |             |             |
| 1     | 2412              | 19.85            | 20.16   | 200.358          | 23.02             | 29.37       | Pass        |
| 6     | 2437              | 20.52            | 21.10   | 241.545          | 23.83             | 29.37       | Pass        |
| 11    | 2462              | 20.36            | 21.15   | 238.96           | 23.78             | 29.37       | Pass        |

**NOTE:** Directional gain =  $3.62\text{dBi} + 10\log(2) = 6.63\text{dBi} > 6\text{dBi}$  , therefore the limit needs to reduce, so the power limit shall be reduced to  $30-(6.63-6) = 29.37\text{dBm}$ .

##### 802.11g

| Chan. | Chan. Freq. (MHz) | Peak Power (dBm) |         | Total Power (mW) | Total Power (dBm) | Limit (dBm) | Pass / Fail |
|-------|-------------------|------------------|---------|------------------|-------------------|-------------|-------------|
|       |                   | Chain 0          | Chain 1 |                  |                   |             |             |
| 1     | 2412              | 19.62            | 19.28   | 176.345          | 22.46             | 29.37       | Pass        |
| 6     | 2437              | 23.38            | 23.85   | 460.432          | 26.63             | 29.37       | Pass        |
| 11    | 2462              | 19.46            | 19.72   | 182.064          | 22.60             | 29.37       | Pass        |

**NOTE:** Directional gain =  $3.62\text{dBi} + 10\log(2) = 6.63\text{dBi} > 6\text{dBi}$  , therefore the limit needs to reduce, so the power limit shall be reduced to  $30-(6.63-6) = 29.37\text{dBm}$ .

## VHT20

| Chan. | Chan. Freq.<br>(MHz) | Peak Power (dBm) |         | Total<br>Power<br>(mW) | Total Power<br>(dBm) | Limit (dBm) | Pass / Fail |
|-------|----------------------|------------------|---------|------------------------|----------------------|-------------|-------------|
|       |                      | Chain 0          | Chain 1 |                        |                      |             |             |
| 1     | 2412                 | 19.07            | 18.93   | 158.887                | 22.01                | 29.37       | Pass        |
| 6     | 2437                 | 23.67            | 23.74   | 469.401                | 26.72                | 29.37       | Pass        |
| 11    | 2462                 | 18.70            | 19.02   | 153.93                 | 21.87                | 29.37       | Pass        |

**NOTE:** Directional gain =  $3.62\text{dBi} + 10\log(2) = 6.63\text{dBi} > 6\text{dBi}$  , therefore the limit needs to reduce, so the power limit shall be reduced to  $30-(6.63-6) = 29.37\text{dBm}$ .

## VHT40

| Chan. | Chan. Freq.<br>(MHz) | Peak Power (dBm) |         | Total<br>Power<br>(mW) | Total Power<br>(dBm) | Limit (dBm) | Pass / Fail |
|-------|----------------------|------------------|---------|------------------------|----------------------|-------------|-------------|
|       |                      | Chain 0          | Chain 1 |                        |                      |             |             |
| 3     | 2422                 | 17.23            | 17.12   | 104.368                | 20.19                | 29.37       | Pass        |
| 6     | 2437                 | 19.00            | 20.98   | 204.747                | 23.11                | 29.37       | Pass        |
| 9     | 2452                 | 14.96            | 14.88   | 62.094                 | 17.93                | 29.37       | Pass        |

**NOTE:** Directional gain =  $3.62\text{dBi} + 10\log(2) = 6.63\text{dBi} > 6\text{dBi}$  , therefore the limit needs to reduce, so the power limit shall be reduced to  $30-(6.63-6) = 29.37\text{dBm}$ .

## FOR AVERAGE POWER

### 802.11b

| Chan. | Chan. Freq.<br>(MHz) | Average Power (dBm) |         | Total Power<br>(mW) | Total Power<br>(dBm) |
|-------|----------------------|---------------------|---------|---------------------|----------------------|
|       |                      | Chain 0             | Chain 1 |                     |                      |
| 1     | 2412                 | 17.51               | 18.01   | 119.605             | 20.78                |
| 6     | 2437                 | 18.36               | 18.82   | 144.757             | 21.61                |
| 11    | 2462                 | 18.18               | 19.10   | 147.049             | 21.67                |

### 802.11g

| Chan. | Chan. Freq.<br>(MHz) | Average Power (dBm) |         | Total Power<br>(mW) | Total Power<br>(dBm) |
|-------|----------------------|---------------------|---------|---------------------|----------------------|
|       |                      | Chain 0             | Chain 1 |                     |                      |
| 1     | 2412                 | 13.42               | 13.40   | 43.857              | 16.42                |
| 6     | 2437                 | 18.03               | 18.10   | 128.098             | 21.08                |
| 11    | 2462                 | 13.43               | 13.60   | 44.938              | 16.53                |

### VHT20

| Chan. | Chan. Freq.<br>(MHz) | Average Power (dBm) |         | Total Power<br>(mW) | Total Power<br>(dBm) |
|-------|----------------------|---------------------|---------|---------------------|----------------------|
|       |                      | Chain 0             | Chain 1 |                     |                      |
| 1     | 2412                 | 13.30               | 12.38   | 38.678              | 15.87                |
| 6     | 2437                 | 18.00               | 18.04   | 126.776             | 21.03                |
| 11    | 2462                 | 12.32               | 12.31   | 34.083              | 15.33                |

### VHT40

| Chan. | Chan. Freq.<br>(MHz) | Average Power (dBm) |         | Total Power<br>(mW) | Total Power<br>(dBm) |
|-------|----------------------|---------------------|---------|---------------------|----------------------|
|       |                      | Chain 0             | Chain 1 |                     |                      |
| 3     | 2422                 | 11.06               | 10.64   | 24.352              | 13.87                |
| 6     | 2437                 | 14.25               | 14.76   | 56.53               | 17.52                |
| 9     | 2452                 | 8.30                | 8.22    | 13.398              | 11.27                |

## 4.2 Radiated Emission and Bandedge Measurement

### 4.2.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

| Frequencies (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490     | 2400/F(kHz)                       | 300                           |
| 0.490 ~ 1.705     | 24000/F(kHz)                      | 30                            |
| 1.705 ~ 30.0      | 30                                | 30                            |
| 30 ~ 88           | 100                               | 3                             |
| 88 ~ 216          | 150                               | 3                             |
| 216 ~ 960         | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

#### NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.2.2 Test Instruments

##### For Above 1GHz:

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                                | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------|--------------------------|-------------------------------------------|-----------------|------------------|
| Test Receiver<br>Agilent                | N9038A                   | MY50010156                                | Aug. 11, 2014   | Aug. 10, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-04                                | Nov. 12, 2014   | Nov. 11, 2015    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-361                                  | Feb. 06, 2015   | Feb. 05, 2016    |
| RF Cable                                | NA                       | CHHCAB_001                                | Oct. 05, 2014   | Oct. 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000220091110                             | Feb. 06, 2015   | Feb. 05, 2016    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 300801923                                 | Oct. 28, 2014   | Oct. 27, 2015    |
| RF Cable                                | NA                       | 131206<br>131213<br>131215<br>SNMY23685/4 | Jan. 16, 2015   | Jan. 15, 2016    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                                    | July 05, 2014   | July 04, 2015    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                      | Dec. 12, 2014   | Dec. 11, 2015    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                                  | Feb. 05, 2015   | Feb. 04, 2016    |
| RF Cable                                | NA                       | 329751/4<br>RF104-204                     | Dec. 11, 2014   | Dec. 10, 2015    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                        | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                        | NA              | NA               |

##### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
- 5 The CANADA Site Registration No. is IC 7450H-3.
- 6 Tested Date: May 08, 2015

**For Below 1GHz:**

| DESCRIPTION & MANUFACTURER              | MODEL NO.        | SERIAL NO.                                | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------|------------------|-------------------------------------------|-----------------|------------------|
| Test Receiver<br>Agilent                | N9038A           | MY51210105                                | July 21, 2014   | July 20, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B | AMP-ZFL-03                                | Nov. 12, 2014   | Nov. 11, 2015    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168        | 9168-360                                  | Feb. 09, 2015   | Feb. 08, 2016    |
| RF Cable                                | NA               | CHGCAB_001                                | Oct. 04, 2014   | Oct. 03, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018         | 0000320091110                             | Feb. 09, 2015   | Feb. 08, 2016    |
| Pre-Amplifier<br>Agilent                | 8449B            | 3008A02578                                | June 24, 2014   | June 23, 2015    |
| RF Cable                                | NA               | 131205<br>131216<br>131217<br>SNMY23684/4 | Jan. 16, 2015   | Jan. 15, 2016    |
| Spectrum Analyzer<br>R&S                | FSV40            | 100964                                    | July 05, 2014   | July 04, 2015    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6       | 9K16                                      | Dec. 12, 2014   | Dec. 11, 2015    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170        | 9170-424                                  | Feb. 05, 2015   | Feb. 04, 2016    |
| RF Cable                                | NA               | 329751/4<br>RF104-204                     | Dec. 11, 2014   | Dec. 10, 2015    |
| Antenna Tower & Turn Table<br>CT        | NA               | NA                                        | NA              | NA               |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: May 08, 2015

#### 4.2.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

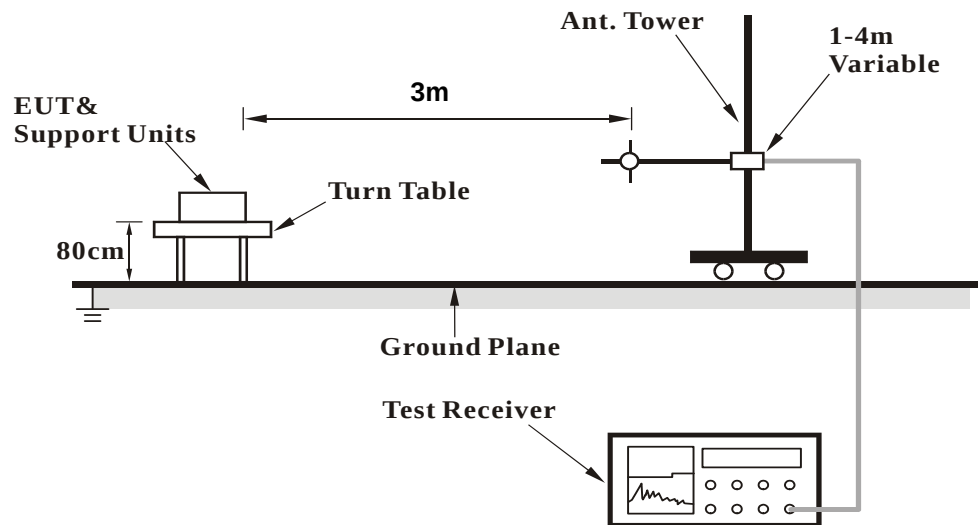
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $10 \log(1/\text{duty cycle})$ ).
5. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
6. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 Deviation from Test Standard

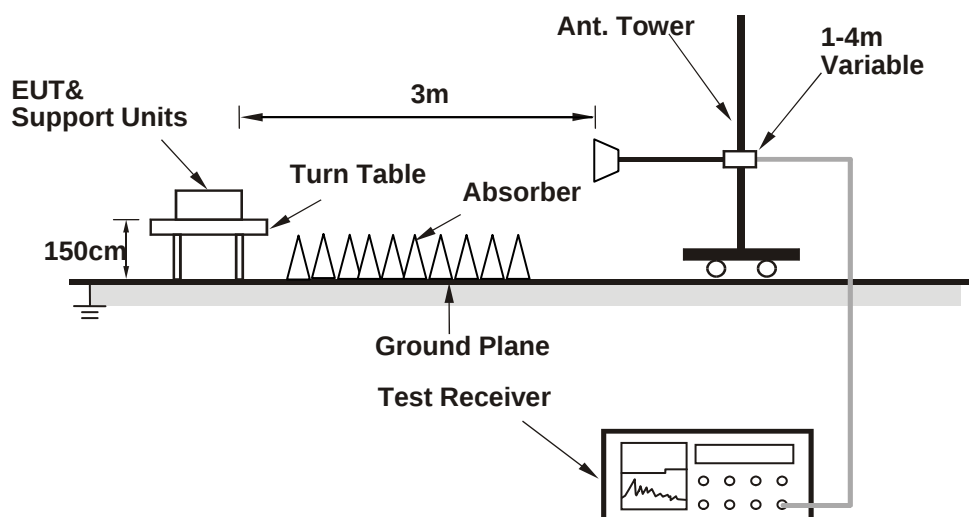
Testing for radiated emissions above 1GHz was performed with the EUT elevated at 1.5m instead of 0.8m. 1.5m is the required height in ANSI C63.10:2013 as referenced by RSS GEN issue 4. This test height has been permitted by FCC as discussed in FCC-TCB conference call in December 2014.

#### 4.2.5 Test Setup

##### <Frequency Range below 1GHz>



##### <Frequency Range above 1GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

#### 4.2.6 EUT Operating Conditions

1. Connect the EUT with the support unit A (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program "QCRT Version: 3.0.29.0" to enable EUT under transmission/receiving condition continuously at specific channel frequency.

#### 4.2.7 Test Results

##### Above 1GHz Data

##### 802.11b

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 1 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 53.0 PK                       | 74.0              | -21.0          | 1.00 H                   | 360                        | 56.19                  | -3.19                          |
| 2                                                   | 2390.00        | 40.4 AV                       | 54.0              | -13.6          | 1.00 H                   | 360                        | 43.59                  | -3.19                          |
| 3                                                   | *2412.00       | 108.2 PK                      |                   |                | 1.00 H                   | 360                        | 111.33                 | -3.13                          |
| 4                                                   | *2412.00       | 105.8 AV                      |                   |                | 1.00 H                   | 360                        | 108.93                 | -3.13                          |
| 5                                                   | 4824.00        | 56.3 PK                       | 74.0              | -17.7          | 2.02 H                   | 328                        | 50.33                  | 5.97                           |
| 6                                                   | 4824.00        | 52.0 AV                       | 54.0              | -2.0           | 2.02 H                   | 328                        | 46.03                  | 5.97                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 57.3 PK                       | 74.0              | -16.7          | 1.59 V                   | 266                        | 60.49                  | -3.19                          |
| 2                                                   | 2390.00        | 44.7 AV                       | 54.0              | -9.3           | 1.59 V                   | 266                        | 47.89                  | -3.19                          |
| 3                                                   | *2412.00       | 111.3 PK                      |                   |                | 1.59 V                   | 266                        | 114.43                 | -3.13                          |
| 4                                                   | *2412.00       | 109.0 AV                      |                   |                | 1.59 V                   | 266                        | 112.13                 | -3.13                          |
| 5                                                   | 4824.00        | 56.9 PK                       | 74.0              | -17.1          | 1.29 V                   | 265                        | 50.93                  | 5.97                           |
| 6                                                   | 4824.00        | 52.5 AV                       | 54.0              | -1.5           | 1.29 V                   | 265                        | 46.53                  | 5.97                           |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 6 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

# ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2437.00       | 108.8 PK                      |                   |                | 1.02 H                   | 360                        | 111.84                 | -3.04                          |
| 2   | *2437.00       | 106.2 AV                      |                   |                | 1.02 H                   | 360                        | 109.24                 | -3.04                          |
| 3   | 4874.00        | 56.1 PK                       | 74.0              | -17.9          | 1.98 H                   | 326                        | 50.05                  | 6.05                           |
| 4   | 4874.00        | 51.8 AV                       | 54.0              | -2.2           | 1.98 H                   | 326                        | 45.75                  | 6.05                           |
| 5   | 7311.00        | 60.3 PK                       | 74.0              | -13.7          | 2.09 H                   | 324                        | 49.36                  | 10.94                          |
| 6   | 7311.00        | 50.6 AV                       | 54.0              | -3.4           | 2.09 H                   | 324                        | 39.66                  | 10.94                          |

# ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2437.00       | 111.3 PK                      |                   |                | 1.61 V                   | 264                        | 114.34                 | -3.04                          |
| 2   | *2437.00       | 109.4 AV                      |                   |                | 1.61 V                   | 264                        | 112.44                 | -3.04                          |
| 3   | 4874.00        | 56.7 PK                       | 74.0              | -17.3          | 1.30 V                   | 252                        | 50.65                  | 6.05                           |
| 4   | 4874.00        | 52.6 AV                       | 54.0              | -1.4           | 1.30 V                   | 252                        | 46.55                  | 6.05                           |
| 5   | 7311.00        | 61.3 PK                       | 74.0              | -12.7          | 1.12 V                   | 309                        | 50.36                  | 10.94                          |
| 6   | 7311.00        | 52.6 AV                       | 54.0              | -1.4           | 1.12 V                   | 309                        | 41.66                  | 10.94                          |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                        |               |                              |              |
|------------------------|---------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 11 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz  |                              | Average (AV) |

# ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 108.9 PK                      |                   |                | 1.02 H                   | 360                        | 111.84                 | -2.94                          |
| 2   | *2462.00       | 106.3 AV                      |                   |                | 1.02 H                   | 360                        | 109.24                 | -2.94                          |
| 3   | 2483.50        | 53.3 PK                       | 74.0              | -20.7          | 1.02 H                   | 360                        | 56.17                  | -2.87                          |
| 4   | 2483.50        | 43.6 AV                       | 54.0              | -10.4          | 1.02 H                   | 360                        | 46.47                  | -2.87                          |
| 5   | 4924.00        | 55.5 PK                       | 74.0              | -18.5          | 2.04 H                   | 324                        | 49.43                  | 6.07                           |
| 6   | 4924.00        | 51.4 AV                       | 54.0              | -2.6           | 2.04 H                   | 324                        | 45.33                  | 6.07                           |
| 7   | 7386.00        | 60.6 PK                       | 74.0              | -13.4          | 2.14 H                   | 335                        | 49.18                  | 11.42                          |
| 8   | 7386.00        | 50.7 AV                       | 54.0              | -3.3           | 2.14 H                   | 335                        | 39.28                  | 11.42                          |

# ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 110.3 PK                      |                   |                | 1.56 V                   | 263                        | 113.24                 | -2.94                          |
| 2   | *2462.00       | 108.6 AV                      |                   |                | 1.56 V                   | 263                        | 111.54                 | -2.94                          |
| 3   | 4924.00        | 56.2 PK                       | 74.0              | -17.8          | 1.32 V                   | 276                        | 50.13                  | 6.07                           |
| 4   | 4924.00        | 52.4 AV                       | 54.0              | -1.6           | 1.32 V                   | 276                        | 46.33                  | 6.07                           |
| 5   | 7386.00        | 60.8 PK                       | 74.0              | -13.2          | 1.09 V                   | 310                        | 49.38                  | 11.42                          |
| 6   | 7386.00        | 53.3 AV                       | 54.0              | -0.7           | 1.09 V                   | 310                        | 41.88                  | 11.42                          |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

## 802.11g

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 1 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 54.2 PK                       | 74.0              | -19.8          | 1.48 H                   | 45                         | 57.39                  | -3.19                          |
| 2                                                   | 2390.00        | 42.8 AV                       | 54.0              | -11.2          | 1.48 H                   | 45                         | 45.99                  | -3.19                          |
| 3                                                   | *2412.00       | 106.7 PK                      |                   |                | 1.48 H                   | 45                         | 109.83                 | -3.13                          |
| 4                                                   | *2412.00       | 96.4 AV                       |                   |                | 1.48 H                   | 45                         | 99.53                  | -3.13                          |
| 5                                                   | 4824.00        | 56.2 PK                       | 74.0              | -17.8          | 1.43 H                   | 344                        | 50.23                  | 5.97                           |
| 6                                                   | 4824.00        | 43.5 AV                       | 54.0              | -10.5          | 1.43 H                   | 344                        | 37.53                  | 5.97                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 62.4 PK                       | 74.0              | -11.6          | 1.57 V                   | 266                        | 65.59                  | -3.19                          |
| 2                                                   | 2390.00        | 47.6 AV                       | 54.0              | -6.4           | 1.57 V                   | 266                        | 50.79                  | -3.19                          |
| 3                                                   | *2412.00       | 110.3 PK                      |                   |                | 1.57 V                   | 266                        | 113.43                 | -3.13                          |
| 4                                                   | *2412.00       | 99.2 AV                       |                   |                | 1.57 V                   | 266                        | 102.33                 | -3.13                          |
| 5                                                   | 4824.00        | 55.9 PK                       | 74.0              | -18.1          | 1.28 V                   | 101                        | 49.93                  | 5.97                           |
| 6                                                   | 4824.00        | 43.2 AV                       | 54.0              | -10.8          | 1.28 V                   | 101                        | 37.23                  | 5.97                           |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 6 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | *2437.00       | 110.2 PK                      |                   |                | 1.46 H                   | 46                         | 113.24                 | -3.04                          |
| 2                                                   | *2437.00       | 99.7 AV                       |                   |                | 1.46 H                   | 46                         | 102.74                 | -3.04                          |
| 3                                                   | 4874.00        | 57.3 PK                       | 74.0              | -16.7          | 1.40 H                   | 326                        | 51.25                  | 6.05                           |
| 4                                                   | 4874.00        | 45.3 AV                       | 54.0              | -8.7           | 1.40 H                   | 326                        | 39.25                  | 6.05                           |
| 5                                                   | 7311.00        | 59.1 PK                       | 74.0              | -14.9          | 1.60 H                   | 303                        | 48.16                  | 10.94                          |
| 6                                                   | 7311.00        | 47.4 AV                       | 54.0              | -6.6           | 1.60 H                   | 303                        | 36.46                  | 10.94                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | *2437.00       | 113.5 PK                      |                   |                | 1.58 V                   | 262                        | 116.54                 | -3.04                          |
| 2                                                   | *2437.00       | 102.9 AV                      |                   |                | 1.58 V                   | 262                        | 105.94                 | -3.04                          |
| 3                                                   | 4874.00        | 58.7 PK                       | 74.0              | -15.3          | 1.29 V                   | 121                        | 52.65                  | 6.05                           |
| 4                                                   | 4874.00        | 46.0 AV                       | 54.0              | -8.0           | 1.29 V                   | 121                        | 39.95                  | 6.05                           |
| 5                                                   | 7311.00        | 61.4 PK                       | 74.0              | -12.6          | 1.06 V                   | 304                        | 50.46                  | 10.94                          |
| 6                                                   | 7311.00        | 48.4 AV                       | 54.0              | -5.6           | 1.06 V                   | 304                        | 37.46                  | 10.94                          |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                        |               |                              |              |
|------------------------|---------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 11 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz  |                              | Average (AV) |

# ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 107.2 PK                      |                   |                | 1.43 H                   | 46                         | 110.14                 | -2.94                          |
| 2   | *2462.00       | 96.6 AV                       |                   |                | 1.43 H                   | 46                         | 99.54                  | -2.94                          |
| 3   | 2483.50        | 54.2 PK                       | 74.0              | -19.8          | 1.43 H                   | 46                         | 57.07                  | -2.87                          |
| 4   | 2483.50        | 42.1 AV                       | 54.0              | -11.9          | 1.43 H                   | 46                         | 44.97                  | -2.87                          |
| 5   | 4924.00        | 56.3 PK                       | 74.0              | -17.7          | 1.41 H                   | 342                        | 50.23                  | 6.07                           |
| 6   | 4924.00        | 43.4 AV                       | 54.0              | -10.6          | 1.41 H                   | 342                        | 37.33                  | 6.07                           |
| 7   | 7386.00        | 57.4 PK                       | 74.0              | -16.6          | 1.63 H                   | 302                        | 45.98                  | 11.42                          |
| 8   | 7386.00        | 45.6 AV                       | 54.0              | -8.4           | 1.63 H                   | 302                        | 34.18                  | 11.42                          |

# ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 108.8 PK                      |                   |                | 1.63 V                   | 262                        | 111.74                 | -2.94                          |
| 2   | *2462.00       | 98.2 AV                       |                   |                | 1.63 V                   | 262                        | 101.14                 | -2.94                          |
| 3   | 2483.50        | 61.5 PK                       | 74.0              | -12.5          | 1.63 V                   | 262                        | 64.37                  | -2.87                          |
| 4   | 2483.50        | 46.4 AV                       | 54.0              | -7.6           | 1.63 V                   | 262                        | 49.27                  | -2.87                          |
| 5   | 4924.00        | 56.5 PK                       | 74.0              | -17.5          | 1.29 V                   | 106                        | 50.43                  | 6.07                           |
| 6   | 4924.00        | 43.6 AV                       | 54.0              | -10.4          | 1.29 V                   | 106                        | 37.53                  | 6.07                           |
| 7   | 7386.00        | 57.4 PK                       | 74.0              | -16.6          | 1.06 V                   | 305                        | 45.98                  | 11.42                          |
| 8   | 7386.00        | 45.4 AV                       | 54.0              | -8.6           | 1.06 V                   | 305                        | 33.98                  | 11.42                          |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

## VHT20

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 1 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 54.4 PK                       | 74.0              | -19.6          | 1.52 H                   | 51                         | 57.59                  | -3.19                          |
| 2                                                   | 2390.00        | 43.0 AV                       | 54.0              | -11.0          | 1.52 H                   | 51                         | 46.19                  | -3.19                          |
| 3                                                   | *2412.00       | 106.5 PK                      |                   |                | 1.52 H                   | 51                         | 109.63                 | -3.13                          |
| 4                                                   | *2412.00       | 96.3 AV                       |                   |                | 1.52 H                   | 51                         | 99.43                  | -3.13                          |
| 5                                                   | 4824.00        | 56.4 PK                       | 74.0              | -17.6          | 1.38 H                   | 343                        | 50.43                  | 5.97                           |
| 6                                                   | 4824.00        | 43.9 AV                       | 54.0              | -10.1          | 1.38 H                   | 343                        | 37.93                  | 5.97                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 63.1 PK                       | 74.0              | -10.9          | 1.53 V                   | 264                        | 66.29                  | -3.19                          |
| 2                                                   | 2390.00        | 48.0 AV                       | 54.0              | -6.0           | 1.53 V                   | 264                        | 51.19                  | -3.19                          |
| 3                                                   | *2412.00       | 110.8 PK                      |                   |                | 1.53 V                   | 264                        | 113.93                 | -3.13                          |
| 4                                                   | *2412.00       | 99.5 AV                       |                   |                | 1.53 V                   | 264                        | 102.63                 | -3.13                          |
| 5                                                   | 4824.00        | 55.6 PK                       | 74.0              | -18.4          | 1.27 V                   | 109                        | 49.63                  | 5.97                           |
| 6                                                   | 4824.00        | 43.0 AV                       | 54.0              | -11.0          | 1.27 V                   | 109                        | 37.03                  | 5.97                           |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 6 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

# ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2437.00       | 110.2 PK                      |                   |                | 1.45 H                   | 42                         | 113.24                 | -3.04                          |
| 2   | *2437.00       | 99.5 AV                       |                   |                | 1.45 H                   | 42                         | 102.54                 | -3.04                          |
| 3   | 4874.00        | 57.2 PK                       | 74.0              | -16.8          | 1.44 H                   | 330                        | 51.15                  | 6.05                           |
| 4   | 4874.00        | 45.5 AV                       | 54.0              | -8.5           | 1.44 H                   | 330                        | 39.45                  | 6.05                           |
| 5   | 7311.00        | 58.8 PK                       | 74.0              | -15.2          | 1.57 H                   | 316                        | 47.86                  | 10.94                          |
| 6   | 7311.00        | 47.2 AV                       | 54.0              | -6.8           | 1.57 H                   | 316                        | 36.26                  | 10.94                          |

# ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2437.00       | 113.5 PK                      |                   |                | 1.63 V                   | 259                        | 116.54                 | -3.04                          |
| 2   | *2437.00       | 102.7 AV                      |                   |                | 1.63 V                   | 259                        | 105.74                 | -3.04                          |
| 3   | 4874.00        | 58.7 PK                       | 74.0              | -15.3          | 1.28 V                   | 125                        | 52.65                  | 6.05                           |
| 4   | 4874.00        | 45.8 AV                       | 54.0              | -8.2           | 1.28 V                   | 125                        | 39.75                  | 6.05                           |
| 5   | 7311.00        | 61.3 PK                       | 74.0              | -12.7          | 1.05 V                   | 316                        | 50.36                  | 10.94                          |
| 6   | 7311.00        | 48.4 AV                       | 54.0              | -5.6           | 1.05 V                   | 316                        | 37.46                  | 10.94                          |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                 |               |                      |              |
|-----------------|---------------|----------------------|--------------|
| CHANNEL         | TX Channel 11 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      | Average (AV) |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 104.3 PK                      |                   |                | 1.38 H                   | 53                         | 107.24                 | -2.94                          |
| 2   | *2462.00       | 94.3 AV                       |                   |                | 1.38 H                   | 53                         | 97.24                  | -2.94                          |
| 3   | 2483.50        | 54.2 PK                       | 74.0              | -19.8          | 1.38 H                   | 53                         | 57.07                  | -2.87                          |
| 4   | 2483.50        | 42.6 AV                       | 54.0              | -11.4          | 1.38 H                   | 53                         | 45.47                  | -2.87                          |
| 5   | 4924.00        | 55.8 PK                       | 74.0              | -18.2          | 1.43 H                   | 332                        | 49.73                  | 6.07                           |
| 6   | 4924.00        | 42.9 AV                       | 54.0              | -11.1          | 1.43 H                   | 332                        | 36.83                  | 6.07                           |
| 7   | 7386.00        | 57.9 PK                       | 74.0              | -16.1          | 1.58 H                   | 309                        | 46.48                  | 11.42                          |
| 8   | 7386.00        | 46.0 AV                       | 54.0              | -8.0           | 1.58 H                   | 309                        | 34.58                  | 11.42                          |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2462.00       | 106.2 PK                      |                   |                | 1.72 V                   | 262                        | 109.14                 | -2.94                          |
| 2   | *2462.00       | 96.3 AV                       |                   |                | 1.72 V                   | 262                        | 99.24                  | -2.94                          |
| 3   | 2483.50        | 57.3 PK                       | 74.0              | -16.7          | 1.72 V                   | 262                        | 60.17                  | -2.87                          |
| 4   | 2483.50        | 44.3 AV                       | 54.0              | -9.7           | 1.72 V                   | 262                        | 47.17                  | -2.87                          |
| 5   | 4924.00        | 56.9 PK                       | 74.0              | -17.1          | 1.24 V                   | 95                         | 50.83                  | 6.07                           |
| 6   | 4924.00        | 44.0 AV                       | 54.0              | -10.0          | 1.24 V                   | 95                         | 37.93                  | 6.07                           |
| 7   | 7386.00        | 57.1 PK                       | 74.0              | -16.9          | 1.12 V                   | 314                        | 45.68                  | 11.42                          |
| 8   | 7386.00        | 45.2 AV                       | 54.0              | -8.8           | 1.12 V                   | 314                        | 33.78                  | 11.42                          |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

## VHT40

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 3 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 56.5 PK                       | 74.0              | -17.5          | 1.38 H                   | 50                         | 59.69                  | -3.19                          |
| 2                                                   | 2390.00        | 45.4 AV                       | 54.0              | -8.6           | 1.38 H                   | 50                         | 48.59                  | -3.19                          |
| 3                                                   | *2422.00       | 101.3 PK                      |                   |                | 1.38 H                   | 50                         | 104.39                 | -3.09                          |
| 4                                                   | *2422.00       | 91.4 AV                       |                   |                | 1.38 H                   | 50                         | 94.49                  | -3.09                          |
| 5                                                   | 4844.00        | 56.2 PK                       | 74.0              | -17.8          | 1.46 H                   | 324                        | 50.21                  | 5.99                           |
| 6                                                   | 4844.00        | 43.4 AV                       | 54.0              | -10.6          | 1.46 H                   | 324                        | 37.41                  | 5.99                           |
| 7                                                   | 7266.00        | 58.5 PK                       | 74.0              | -15.5          | 1.59 H                   | 307                        | 47.61                  | 10.89                          |
| 8                                                   | 7266.00        | 46.4 AV                       | 54.0              | -7.6           | 1.59 H                   | 307                        | 35.51                  | 10.89                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 61.8 PK                       | 74.0              | -12.2          | 1.57 V                   | 263                        | 64.99                  | -3.19                          |
| 2                                                   | 2390.00        | 48.4 AV                       | 54.0              | -5.6           | 1.57 V                   | 263                        | 51.59                  | -3.19                          |
| 3                                                   | *2422.00       | 104.4 PK                      |                   |                | 1.57 V                   | 263                        | 107.49                 | -3.09                          |
| 4                                                   | *2422.00       | 94.4 AV                       |                   |                | 1.57 V                   | 263                        | 97.49                  | -3.09                          |
| 5                                                   | 4844.00        | 56.6 PK                       | 74.0              | -17.4          | 1.24 V                   | 97                         | 50.61                  | 5.99                           |
| 6                                                   | 4844.00        | 43.6 AV                       | 54.0              | -10.4          | 1.24 V                   | 97                         | 37.61                  | 5.99                           |
| 7                                                   | 7266.00        | 57.3 PK                       | 74.0              | -16.7          | 1.14 V                   | 303                        | 46.41                  | 10.89                          |
| 8                                                   | 7266.00        | 45.4 AV                       | 54.0              | -8.6           | 1.14 V                   | 303                        | 34.51                  | 10.89                          |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                        |              |                              |              |
|------------------------|--------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 6 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz |                              | Average (AV) |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | 2390.00        | 57.6 PK                       | 74.0              | -16.4          | 1.30 H                   | 52                         | 60.79                  | -3.19                          |
| 2   | 2390.00        | 43.3 AV                       | 54.0              | -10.7          | 1.30 H                   | 52                         | 46.49                  | -3.19                          |
| 3   | *2437.00       | 104.4 PK                      |                   |                | 1.30 H                   | 52                         | 107.44                 | -3.04                          |
| 4   | *2437.00       | 94.2 AV                       |                   |                | 1.30 H                   | 52                         | 97.24                  | -3.04                          |
| 5   | 2483.50        | 56.8 PK                       | 74.0              | -17.2          | 1.30 H                   | 52                         | 59.67                  | -2.87                          |
| 6   | 2483.50        | 42.4 AV                       | 54.0              | -11.6          | 1.30 H                   | 52                         | 45.27                  | -2.87                          |
| 7   | 4874.00        | 56.3 PK                       | 74.0              | -17.7          | 1.45 H                   | 330                        | 50.25                  | 6.05                           |
| 8   | 4874.00        | 43.4 AV                       | 54.0              | -10.6          | 1.45 H                   | 330                        | 37.35                  | 6.05                           |
| 9   | 7311.00        | 58.4 PK                       | 74.0              | -15.6          | 1.62 H                   | 301                        | 47.46                  | 10.94                          |
| 10  | 7311.00        | 46.3 AV                       | 54.0              | -7.7           | 1.62 H                   | 301                        | 35.36                  | 10.94                          |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | 2390.00        | 60.5 PK                       | 74.0              | -13.5          | 1.61 V                   | 264                        | 63.69                  | -3.19                          |
| 2   | 2390.00        | 47.3 AV                       | 54.0              | -6.7           | 1.61 V                   | 264                        | 50.49                  | -3.19                          |
| 3   | *2437.00       | 107.7 PK                      |                   |                | 1.61 V                   | 264                        | 110.74                 | -3.04                          |
| 4   | *2437.00       | 97.1 AV                       |                   |                | 1.61 V                   | 264                        | 100.14                 | -3.04                          |
| 5   | 2483.50        | 60.6 PK                       | 74.0              | -13.4          | 1.61 V                   | 264                        | 63.47                  | -2.87                          |
| 6   | 2483.50        | 46.3 AV                       | 54.0              | -7.7           | 1.61 V                   | 264                        | 49.17                  | -2.87                          |
| 7   | 4874.00        | 57.0 PK                       | 74.0              | -17.0          | 1.22 V                   | 105                        | 50.95                  | 6.05                           |
| 8   | 4874.00        | 44.2 AV                       | 54.0              | -9.8           | 1.22 V                   | 105                        | 38.15                  | 6.05                           |
| 9   | 7311.00        | 57.2 PK                       | 74.0              | -16.8          | 1.15 V                   | 322                        | 46.26                  | 10.94                          |
| 10  | 7311.00        | 45.1 AV                       | 54.0              | -8.9           | 1.15 V                   | 322                        | 34.16                  | 10.94                          |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 9 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2452.00       | 98.2 PK                       |                   |                | 1.42 H                   | 56                         | 101.18                 | -2.98                          |
| 2   | *2452.00       | 87.0 AV                       |                   |                | 1.42 H                   | 56                         | 89.98                  | -2.98                          |
| 3   | 2483.50        | 59.6 PK                       | 74.0              | -14.4          | 1.42 H                   | 56                         | 62.47                  | -2.87                          |
| 4   | 2483.50        | 41.3 AV                       | 54.0              | -12.7          | 1.42 H                   | 56                         | 44.17                  | -2.87                          |
| 5   | 4904.00        | 55.6 PK                       | 74.0              | -18.4          | 1.48 H                   | 336                        | 49.52                  | 6.08                           |
| 6   | 4904.00        | 42.6 AV                       | 54.0              | -11.4          | 1.48 H                   | 336                        | 36.52                  | 6.08                           |
| 7   | 7356.00        | 57.5 PK                       | 74.0              | -16.5          | 1.56 H                   | 301                        | 46.28                  | 11.22                          |
| 8   | 7356.00        | 45.8 AV                       | 54.0              | -8.2           | 1.56 H                   | 301                        | 34.58                  | 11.22                          |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| NO. | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
|-----|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| 1   | *2452.00       | 101.6 PK                      |                   |                | 1.53 V                   | 262                        | 104.58                 | -2.98                          |
| 2   | *2452.00       | 90.4 AV                       |                   |                | 1.53 V                   | 262                        | 93.38                  | -2.98                          |
| 3   | 2483.50        | 62.6 PK                       | 74.0              | -11.4          | 1.53 V                   | 262                        | 65.47                  | -2.87                          |
| 4   | 2483.50        | 44.6 AV                       | 54.0              | -9.4           | 1.53 V                   | 262                        | 47.47                  | -2.87                          |
| 5   | 4904.00        | 56.7 PK                       | 74.0              | -17.3          | 1.18 V                   | 105                        | 50.62                  | 6.08                           |
| 6   | 4904.00        | 43.5 AV                       | 54.0              | -10.5          | 1.18 V                   | 105                        | 37.42                  | 6.08                           |
| 7   | 7356.00        | 57.1 PK                       | 74.0              | -16.9          | 1.17 V                   | 307                        | 45.88                  | 11.22                          |
| 8   | 7356.00        | 45.1 AV                       | 54.0              | -8.9           | 1.17 V                   | 307                        | 33.88                  | 11.22                          |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

## Below 1GHz Data

### 802.11g

|                        |              |                              |                 |
|------------------------|--------------|------------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 6 | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | Below 1GHz   |                              |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 215.17         | 39.2 QP                       | 43.5              | -4.3           | 1.50 H                   | 106                        | 55.03                  | -15.87                         |
| 2                                                   | 230.89         | 38.0 QP                       | 46.0              | -8.0           | 1.00 H                   | 278                        | 53.46                  | -15.45                         |
| 3                                                   | 287.92         | 38.5 QP                       | 46.0              | -7.5           | 1.00 H                   | 89                         | 50.96                  | -12.42                         |
| 4                                                   | 323.91         | 41.2 QP                       | 46.0              | -4.8           | 1.00 H                   | 311                        | 52.39                  | -11.22                         |
| 5                                                   | 431.87         | 36.4 QP                       | 46.0              | -9.6           | 2.00 H                   | 252                        | 44.59                  | -8.21                          |
| 6                                                   | 896.31         | 38.6 QP                       | 46.0              | -7.4           | 1.50 H                   | 109                        | 37.94                  | 0.63                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 134.76         | 31.4 QP                       | 43.5              | -12.1          | 1.00 V                   | 279                        | 45.01                  | -13.64                         |
| 2                                                   | 215.90         | 38.7 QP                       | 43.5              | -4.8           | 1.50 V                   | 213                        | 54.50                  | -15.83                         |
| 3                                                   | 287.87         | 36.1 QP                       | 46.0              | -9.9           | 1.15 V                   | 339                        | 48.54                  | -12.42                         |
| 4                                                   | 322.72         | 41.5 QP                       | 46.0              | -4.5           | 1.00 V                   | 332                        | 52.72                  | -11.26                         |
| 5                                                   | 359.85         | 42.5 QP                       | 46.0              | -3.5           | 1.00 V                   | 325                        | 53.04                  | -10.55                         |
| 6                                                   | 430.32         | 39.3 QP                       | 46.0              | -6.7           | 1.00 V                   | 345                        | 47.57                  | -8.25                          |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

### 4.3 Conducted Emission Measurement

#### 4.3.1 Limits of Conducted Emission Measurement

| Frequency (MHz) | Conducted Limit (dBuV) |         |
|-----------------|------------------------|---------|
|                 | Quasi-peak             | Average |
| 0.15 - 0.5      | 66 - 56                | 56 - 46 |
| 0.50 - 5.0      | 56                     | 46      |
| 5.0 - 30.0      | 60                     | 50      |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

#### 4.3.2 Test Instruments

| DESCRIPTION & MANUFACTURER                                                     | MODEL NO.               | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|--------------------------------------------------------------------------------|-------------------------|------------|-----------------|------------------|
| Test Receiver<br>ROHDE & SCHWARZ                                               | ESCS 30                 | 847124/029 | Oct. 22, 2014   | Oct. 21, 2015    |
| Line-Impedance<br>Stabilization Network<br>(for EUT)<br>SCHWARZBECK            | NSLK-8127               | 8127-522   | Sep. 15, 2014   | Sep. 14, 2015    |
| Line-Impedance<br>Stabilization Network<br>(for Peripheral)<br>ROHDE & SCHWARZ | ENV216                  | 100071     | Nov. 10, 2014   | Nov. 09, 2015    |
| RF Cable<br>(JYEBAO)                                                           | 5D-FB                   | COCCAB-001 | Mar. 09, 2015   | Mar. 08, 2016    |
| 50 ohms Terminator                                                             | N/A                     | EMC-03     | Sep. 22, 2014   | Sep. 21, 2015    |
| 50 ohms Terminator                                                             | N/A                     | EMC-02     | Sep. 30, 2014   | Sep. 29, 2015    |
| Software<br>ADT                                                                | BV<br>ADT_Cond_V7.3.7.3 | NA         | NA              | NA               |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: May 08, 2015

### 4.3.3 Test Procedures

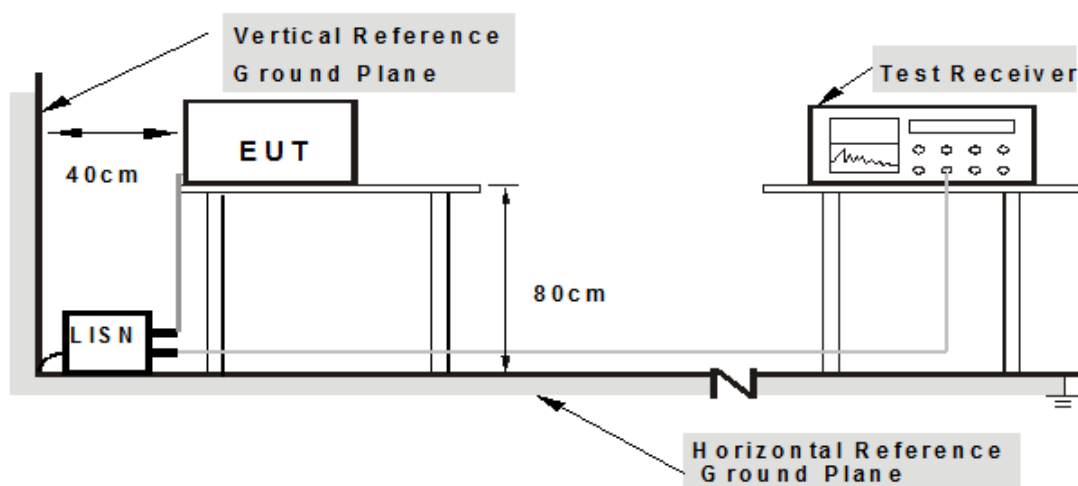
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

### 4.3.4 Deviation from Test Standard

No deviation.

### 4.3.5 Test Setup



**Note:** 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 4.3.6 EUT Operating Conditions

Same as 4.2.6.

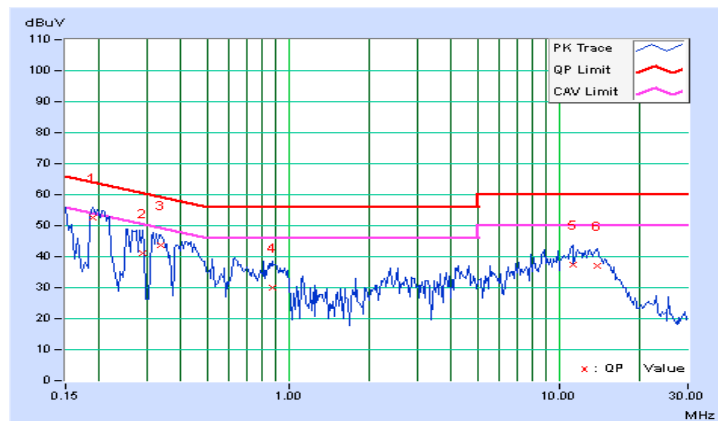
#### 4.3.7 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|----------|-------------------|--------------------------------|
|-------|----------|-------------------|--------------------------------|

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) |       | Emission Level (dBuV) |       | Limit (dBuV) |       | Margin (dB) |        |
|----|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
|    |                 |                        | Q.P.                 | AV.   | Q.P.                  | AV.   | Q.P.         | AV.   | Q.P.        | AV.    |
| 1  | 0.18906         | 0.09                   | 52.53                | 36.63 | 52.62                 | 36.72 | 64.08        | 54.08 | -11.46      | -17.36 |
| 2  | 0.29063         | 0.09                   | 41.11                | 21.78 | 41.20                 | 21.87 | 60.51        | 50.51 | -19.30      | -28.63 |
| 3  | 0.33750         | 0.10                   | 43.48                | 31.03 | 43.58                 | 31.13 | 59.26        | 49.26 | -15.69      | -18.14 |
| 4  | 0.86875         | 0.12                   | 29.88                | 17.56 | 30.00                 | 17.68 | 56.00        | 46.00 | -26.00      | -28.32 |
| 5  | 11.22266        | 0.48                   | 37.09                | 28.86 | 37.57                 | 29.34 | 60.00        | 50.00 | -22.43      | -20.66 |
| 6  | 13.79297        | 0.54                   | 36.60                | 28.44 | 37.14                 | 28.98 | 60.00        | 50.00 | -22.86      | -21.02 |

#### REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

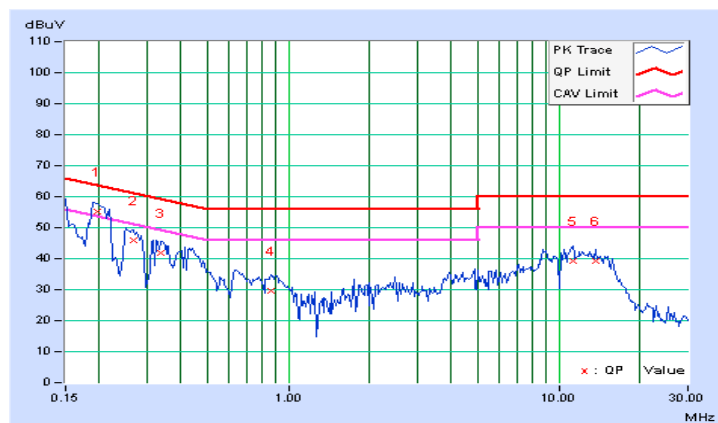


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| No | Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) |       | Emission Level (dBuV) |       | Limit (dBuV) |       | Margin (dB) |        |
|----|-----------------|------------------------|----------------------|-------|-----------------------|-------|--------------|-------|-------------|--------|
|    |                 |                        | Q.P.                 | AV.   | Q.P.                  | AV.   | Q.P.         | AV.   | Q.P.        | AV.    |
| 1  | 0.19687         | 0.08                   | 55.28                | 41.44 | 55.36                 | 41.52 | 63.74        | 53.74 | -8.38       | -12.22 |
| 2  | 0.26719         | 0.09                   | 45.98                | 32.35 | 46.07                 | 32.44 | 61.20        | 51.20 | -15.14      | -18.77 |
| 3  | 0.33750         | 0.09                   | 41.66                | 27.99 | 41.75                 | 28.08 | 59.26        | 49.26 | -17.51      | -21.18 |
| 4  | 0.85703         | 0.12                   | 29.50                | 11.46 | 29.62                 | 11.58 | 56.00        | 46.00 | -26.38      | -34.42 |
| 5  | 11.22656        | 0.49                   | 38.63                | 28.12 | 39.12                 | 28.61 | 60.00        | 50.00 | -20.88      | -21.39 |
| 6  | 13.61328        | 0.56                   | 38.52                | 28.19 | 39.08                 | 28.75 | 60.00        | 50.00 | -20.92      | -21.25 |

#### REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

## 6 Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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