



# FCC TEST REPORT (15.407)

**REPORT NO.:** RF120614C11G-1

**MODEL NO.:** RSVLC-1103

**FCC ID:** B94RSVLC1103

**RECEIVED:** Mar. 11, 2014

**TESTED:** May 31 ~ Jun. 04, 2014

**ISSUED:** Jun. 04, 2014

**APPLICANT:** Hewlett-Packard Company

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CA95747

**ISSUED BY:** Bureau Veritas Consumer Products Services  
(H.K.) Ltd., Taoyuan Branch

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**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei  
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## RELEASE CONTROL RECORD

| ISSUE NO.      | REASON FOR CHANGE | DATE ISSUED   |
|----------------|-------------------|---------------|
| RF120614C11G-1 | Original release  | Jun. 04, 2014 |



## 1. CERTIFICATION

**PRODUCT:** HP M220 802.11n AM Access Point (refer to item 3.1 for more detail)  
**MODEL NO.:** RSVLC-1103  
**BRAND:** HP  
**APPLICANT:** Hewlett-Packard Company  
**TESTED:** May 31 ~ Jun. 04, 2014  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS: FCC Part 15, Subpart E (Section 15.407)**  
ANSI C63.10-2009

This report is issued as a supplementary report of **RF120614C11-1**. This report shall be used combined together with its original report.

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Ken Liu / Senior Manager

**NOTE:** Test items for conducted emission test and radiated emission below 1GHz test were performed for this addendum. Other testing data refer to original report.

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART E (SECTION 15.407) |                             |        |  |
|---|-----------------------------|--------|--|
| STANDARD SECTION  | TEST TYPE                   | RESULT | REMARK   |
| 15.407(b)(6)  | AC Power Conducted Emission | PASS   | Meet the requirement of limit. Minimum passing margin is -10.32dB at 0.17344MHz. |
| 15.407(b/1/2/3)<br>(b)(6)                                 | Spurious Emissions          | PASS   | Meet the requirement of limit. Minimum passing margin is -3.1dB at 47.10MHz.     |
| 15.407(a/1/2)   | Peak Transmit Power         | PASS   | Refer to NOTE below  |
| 15.407(a)(6)  | Peak Power Excursion        | PASS   | Refer to NOTE below  |
| 15.407(a/1/2)   | Peak Power Spectral Density | PASS   | Refer to NOTE below  |
| 15.407(g)   | Frequency Stability         | PASS   | Refer to NOTE below  |
| 15.203  | Antenna Requirement         | PASS   | Antenna connector is I-PEX not a standard connector.                             |

**NOTE:** Test items for conducted emission test and radiated emission below 1GHz test were performed for this addendum. Other testing data refer to original 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       | UNCERTAINTY |
|---------------------|-----------------|-------------|
| Conducted Emissions | 9kHz~30MHz      | 2.44 dB     |
| Radiated emissions  | 30MHz ~ 200MHz  | 2.93 dB     |
|                     | 200MHz ~1000MHz | 2.95 dB     |
|                     | 1GHz ~ 18GHz    | 2.26 dB     |
|                     | 18GHz ~ 40GHz   | 1.94 dB     |

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

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                              |   |
|------------------------------|---|
| <b>EUT</b>                   | HP M220 802.11n AM Access Point (refer to note as below)                              |
| <b>MODEL NO.</b>             | RSVLC-1103  |
| <b>POWER SUPPLY</b>          | 12Vdc (Adapter)<br>48Vdc (POE)  |
| <b>MODULATION TYPE</b>       | 64QAM, 16QAM, QPSK, BPSK  |
| <b>MODULATION TECHNOLOGY</b> | OFDM  |
| <b>TRANSFER RATE</b>         | 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps<br>802.11n: up to 300.0Mbps |
| <b>OPERATING FREQUENCY</b>   | 5180.0 ~ 5240.0MHz  |
| <b>NUMBER OF CHANNEL</b>     | 4 for 802.11a, 802.11n (20MHz)<br>2 for 802.11n (40MHz)                               |
| <b>OUTPUT POWER</b>          | 29.6mW  |
| <b>ANTENNA TYPE</b>          | PCB antenna with 5dBi gain  |
| <b>ANTENNA CONNECTOR</b>     | I-PEX   |
| <b>DATA CABLE</b>            | NA  |
| <b>I/O PORTS</b>             | Refer to user's manual  |
| <b>ACCESSORY DEVICES</b>     | Adapter   |

**NOTE:**

1. This is a supplementary report of RF120614C11-1. This report shall be combined together with its original report.
2. This report is prepared for FCC class II permissive change. The differences compared with the original report are adding product names and changing the SW operation interface. Test items for conducted emission test and radiated emission below 1GHz test had been re-tested and presented in this report.
3. The product names listed as below are identical to each other except their product name due to marketing purpose. (New product names are marked in boldface.)

| Brand | Model      | Product name                           |
|-------|------------|--|
| HP    | RSVLC-1103 | HP M220 802.11n AM Access Point        |
|       |            | HP M220 802.11n WW Access Point        |
|       |            | <b>HP M210 802.11n AM Access Point</b> |
|       |            | <b>HP M210 802.11n WW Access Point</b> |

4. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and three receivers.

| MODULATION MODE | TX FUNCTION |
|-----------------|-------------|
| 802.11a         | 2TX         |
| 802.11n (20MHz) | 2TX         |
| 802.11n (40MHz) | 2TX         |

5. The EUT were powered by the following adapter & POE:

| <b>ADAPTER</b>     |                                      |
|--------------------|--------------------------------------|
| <b>BRAND:</b>      | DELTA ELECTRONICS, INC.              |
| <b>MODEL:</b>      | EADP-15DC A                          |
| <b>INPUT:</b>      | 100-240Vac, 0.4A, 50/60Hz LPS        |
| <b>OUTPUT:</b>     | 12Vdc, 1.25A                         |
| <b>POWER LINE:</b> | 1.8m non-shielded cable without core |

| <b>POE</b>         |                                      |
|--------------------|--------------------------------------|
| <b>BRAND:</b>      | PowerDsine                           |
| <b>MODEL:</b>      | PD-3501G/AC                          |
| <b>INPUT:</b>      | 100-240Vac, 0.5A, 50/60Hz            |
| <b>OUTPUT:</b>     | 48Vdc, 0.35A                         |
| <b>POWER LINE:</b> | 1.9m non-shielded cable without core |

\* POE is provided as support units only.

6. The EUT had been pre-tested on the positioned of each 3 modes. The worst case was found when positioned on mode 2.

| <b>TEST MODE</b> | <b>POSITIONED</b>                      |
|------------------|--|
| <b>MODE 1</b>    | Horizontal (desk top) mounting         |
| <b>MODE 2</b>    | Vertical (wall) mounting               |
| <b>MODE 3</b>    | Inverted horizontal (ceiling) mounting |

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

### 3.2 DESCRIPTION OF TEST MODES

4 channels are provided for 802.11a, 802.11n (20MHz):

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|
| 36      | 5180MHz   | 44      | 5220MHz   |
| 40      | 5200MHz   | 48      | 5240MHz   |

2 channels are provided for 802.11n (40MHz):

| CHANNEL | FREQUENCY | CHANNEL | FREQUENCY |
|---------|-----------|---------|-----------|
| 38      | 5190MHz   | 46      | 5230MHz   |

#### POWER SETTING

| 802.11a |                              | 802.11n (20MHz) |                              |
|---------|------------------------------|-----------------|------------------------------|
| CHANNEL | POWER SETTING (txpwr1 -o -q) | CHANNEL         | POWER SETTING (txpwr1 -o -q) |
| 36      | 30                           | 36              | 32                           |
| 40      | 30                           | 40              | 30                           |
| 48      | 30                           | 48              | 32                           |

| 802.11n (40MHz) |                              |
|-----------------|------------------------------|
| CHANNEL         | POWER SETTING (txpwr1 -o -q) |
| 38              | 44                           |
| 46              | 44                           |



### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | APPLICABLE TO |     | DESCRIPTION        |
|--------------------|---------------|-----|--------------------|
|                    | RE<1G         | PLC |                    |
| A                  | √             | √   | Power from Adapter |
| B                  | √             | √   | Power from POE     |

Where **RE<1G**: Radiated Emission below 1GHz **PLC**: Power Line Conducted Emission

**NOTE:** The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane (Vertical (wall) mounting)**.

#### 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.

| EUT CONFIGURE MODE | MODE            | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|--------------------|-----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| A & B              | 802.11n (40MHz) | 38 to 46          | 46             | OFDM                  | BPSK            | 15.0             |

#### 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.

| EUT CONFIGURE MODE | MODE            | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | DATA RATE (Mbps) |
|--------------------|-----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| A & B              | 802.11n (40MHz) | 38 to 46          | 46             | OFDM                  | BPSK            | 15.0             |

#### TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS           | INPUT POWER           | TESTED BY |
|---------------|------------------------------------|-----------------------|-----------|
| RE<1G         | 25deg. C, 68%RH<br>25deg. C, 65%RH | 120Vac, 60Hz<br>48Vdc | Sun Lin   |
| PLC           | 25deg. C, 68%RH                    | 120Vac, 60Hz<br>48Vdc | Sun Lin   |

### 3.3 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           |
|-----|----------|------------|-------------|------------|------------------|
| 1   | NOTEBOOK | DELL       | E5410       | 1HC2XM1    | FCC DoC Approved |
| 2   | POE      | PowerDsine | PD-3501G/AC | NA         | NA               |

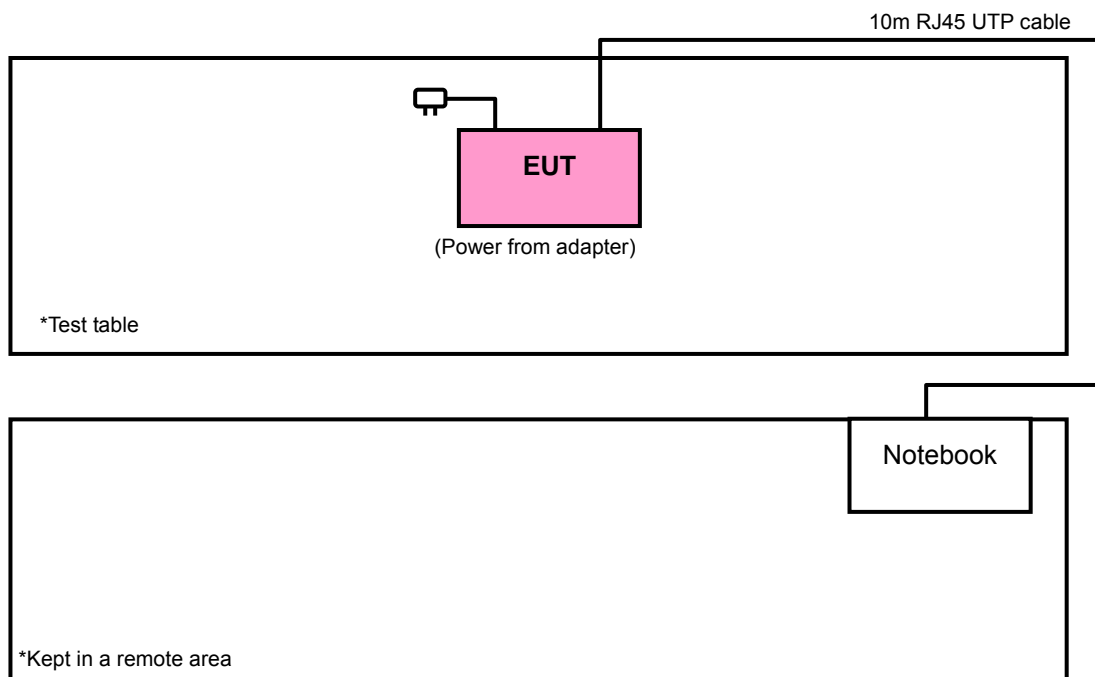
| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1   | 10m RJ45 cable without core                         |
| 2   | 0.8m RJ45 cable without core                        |

**NOTE:**

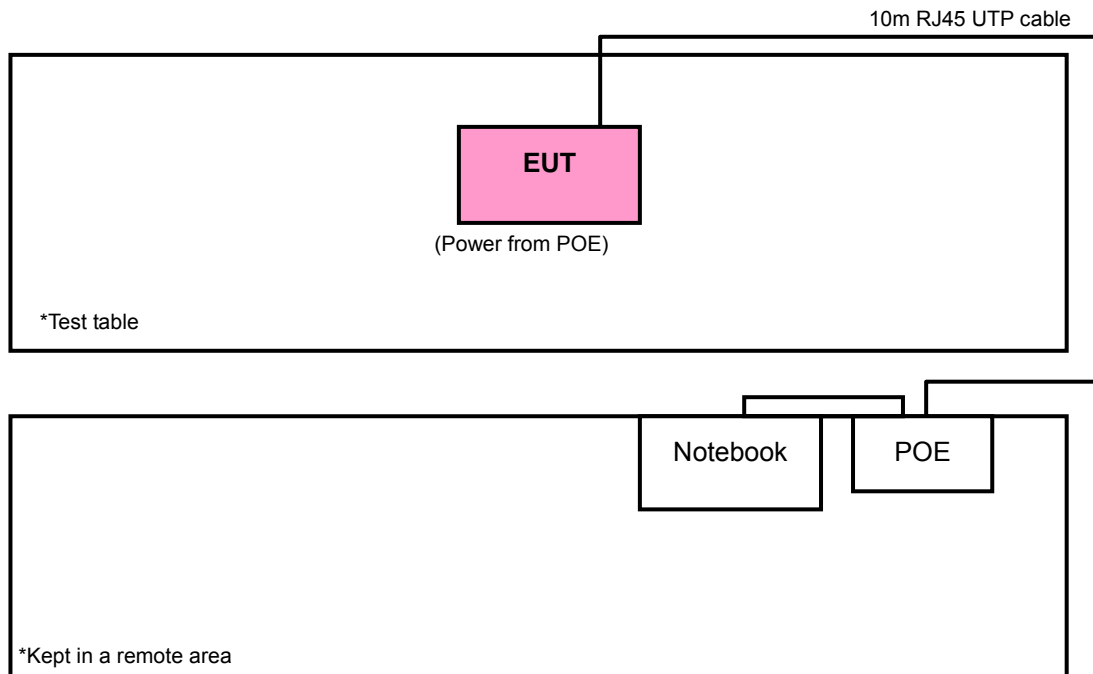
1. All power cords of the above support units are non shielded (1.8m).
2. Items 1-2 acted as communication partners to transfer data.
3. Item 2 was provided by the manufacturer.

#### 3.3.1 CONFIGURATION OF SYSTEM UNDER TEST

**TEST MODE A**



## TEST MODE B



### 3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

#### **FCC Part 15, Subpart E (15.407)**

ANSI C63.10-2009

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

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION AND BANDEDGE MEASUREMENT

#### 4.1.1 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:

| FREQUENCIES<br>(MHz) | FIELD STRENGTH<br>(microvolts/meter) | MEASUREMENT DISTANCE<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009 ~ 0.490        | 2400/F(kHz)                          | 300                              |
| 0.490 ~ 1.705        | 24000/F(kHz)                         | 30                               |
| 1.705 ~ 30.0         | 30                                   | 30                               |
| 30 ~ 88              | 100                                  | 3                                |
| 88 ~ 216             | 150                                  | 3                                |
| 216 ~ 960            | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

**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.

#### 4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER                       | MODEL NO.                    | SERIAL NO.                       | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|--|------------------------------|----------------------------------|---------------------|-------------------------|
| Test Receiver<br>ROHDE & SCHWARZ                 | ESCS30                       | 100289                           | Nov. 29, 2013       | Nov. 28, 2014           |
| Spectrum Analyzer<br>ROHDE & SCHWARZ             | FSP40                        | 100269                           | Feb. 11, 2014       | Feb. 10, 2015           |
| BILOG Antenna<br>SCHWARZBECK                     | VULB9168                     | 9168-156                         | Feb. 25, 2014       | Feb. 24, 2015           |
| HORN Antenna<br>SCHWARZBECK                      | BBHA 9120 D                  | 9120D-209                        | Sep. 12, 2013       | Sep. 11, 2014           |
| HORN Antenna<br>SCHWARZBECK                      | BBHA 9170                    | 148                              | Jul. 15, 2013       | Jul. 14, 2014           |
| Preamplifier<br>Agilent                          | 8449B                        | 3008A01911                       | Aug. 22, 2013       | Aug. 21, 2014           |
| Preamplifier<br>Agilent                          | 8447D                        | 2944A10638                       | Oct. 18, 2013       | Oct. 17, 2014           |
| RF signal cable<br>HUBER+SUHNNER                 | SUCOFLEX 104                 | 248780/4<br>309222/4<br>274092/4 | Aug. 26, 2013       | Aug. 25, 2014           |
| RF signal cable<br>Worken                        | 5D-FB                        | Cable-HYCH9-01                   | Aug. 11, 2013       | Aug. 10, 2014           |
| Software<br>BV ADT                               | ADT_Radiated_<br>V7.6.15.9.4 | NA                               | NA                  | NA                      |
| Antenna Tower<br>EMCO                            | 2070/2080                    | 512.835.4684                     | NA                  | NA                      |
| Turn Table<br>EMCO                               | 2087-2.03                    | NA                               | NA                  | NA                      |
| Antenna Tower & Turn Table<br>Controller<br>EMCO | 2090                         | NA                               | NA                  | NA                      |
| WIT Standard Temperature<br>And Humidity Chamber | TH-4S-C                      | W981030                          | Jun. 10, 2013       | Jun. 09, 2014           |

- 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 HwaYa Chamber 9.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 215374.
  5. The IC Site Registration No. is IC 7450F-9.

#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

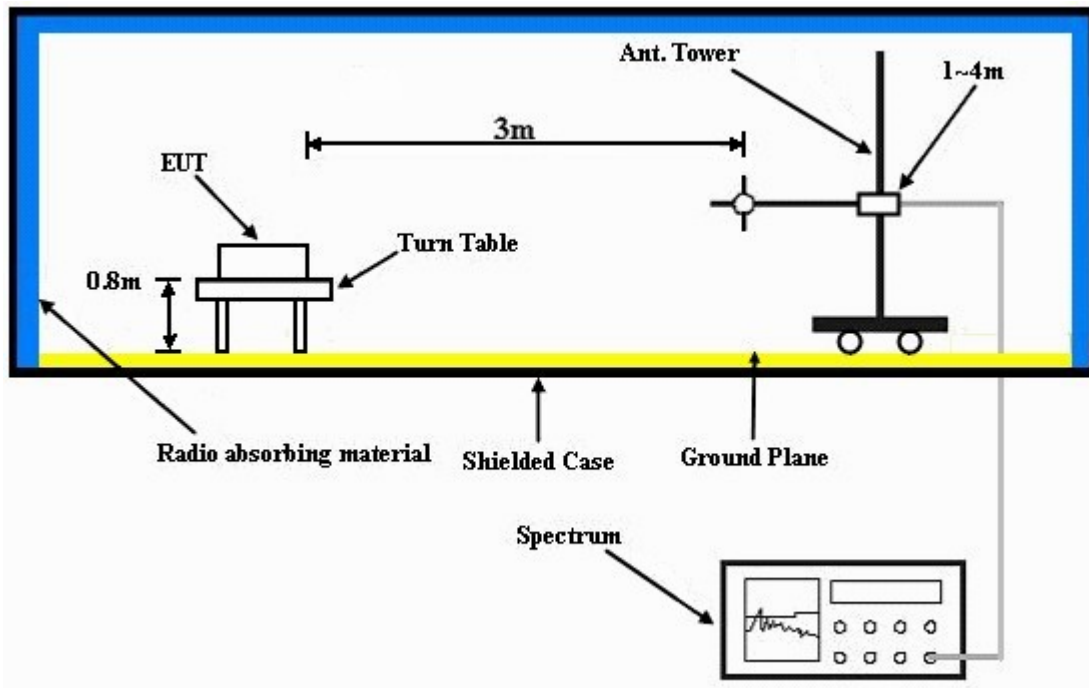
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 1kHz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITION

- a. Placed the EUT on the testing table.
- b. Prepared a notebook and a POE to act as communication partners and placed them outside of testing area.
- c. The communication partners connected with the EUT via RJ45 cables and ran a test program (provided by manufacturer) to enable the EUT under transmission condition continuously at specific channel frequency.
- d. The communication partner sent data to EUT by command "PING".

#### 4.1.7 TEST RESULTS

##### BELOW 1GHz WORST-CASE DATA: 802.11n (40MHz)

| EUT TEST CONDITION       |                 | MEASUREMENT DETAIL |               |
|--------------------------|-----------------|--------------------|---------------|
| CHANNEL                  | Channel 46      | FREQUENCY RANGE    | Below 1000MHz |
| INPUT POWER              | 120Vac, 60Hz    | DETECTOR FUNCTION  | Quasi-Peak    |
| ENVIRONMENTAL CONDITIONS | 25deg. C, 68%RH | TESTED BY          | Sun Lin       |
| TEST MODE                | A               |                    |               |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 98.40       | 33.0 QP                 | 43.5           | -10.5       | 1.99 H             | 68                   | 51.90            | -18.90                   |
| 2   | 216.54      | 35.0 QP                 | 46.0           | -11.0       | 1.24 H             | 251                  | 51.20            | -16.20                   |
| 3   | 280.27      | 31.7 QP                 | 46.0           | -14.3       | 1.00 H             | 246                  | 44.40            | -12.70                   |
| 4   | 415.51      | 27.6 QP                 | 46.0           | -18.4       | 1.99 H             | 141                  | 37.50            | -9.90                    |
| 5   | 499.46      | 32.0 QP                 | 46.0           | -14.0       | 1.49 H             | 41                   | 40.40            | -8.40                    |
| 6   | 797.92      | 35.7 QP                 | 46.0           | -10.3       | 1.24 H             | 15                   | 38.50            | -2.80                    |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |             |                         |                |             |                    |                      |                  |                          |
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 57.98       | 32.0 QP                 | 40.0           | -8.0        | 1.00 V             | 16                   | 46.40            | -14.40                   |
| 2   | 85.96       | 31.4 QP                 | 40.0           | -8.6        | 1.25 V             | 207                  | 51.10            | -19.70                   |
| 3   | 216.54      | 31.9 QP                 | 46.0           | -14.1       | 1.00 V             | 305                  | 48.10            | -16.20                   |
| 4   | 320.69      | 31.7 QP                 | 46.0           | -14.3       | 1.25 V             | 42                   | 43.30            | -11.60                   |
| 5   | 375.10      | 29.5 QP                 | 46.0           | -16.5       | 1.25 V             | 11                   | 40.10            | -10.60                   |
| 6   | 875.64      | 34.8 QP                 | 46.0           | -11.2       | 1.00 V             | 16                   | 36.40            | -1.60                    |

#### 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





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| EUT TEST CONDITION       |                 | MEASUREMENT DETAIL |               |
|--------------------------|-----------------|--------------------|---------------|
| CHANNEL                  | Channel 46      | FREQUENCY RANGE    | Below 1000MHz |
| INPUT POWER (SYSTEM)     | 120Vac, 60Hz    | DETECTOR FUNCTION  | Quasi-Peak    |
| ENVIRONMENTAL CONDITIONS | 25deg. C, 65%RH | TESTED BY          | Sun Lin       |
| TEST MODE                | B               |                    |               |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 98.40       | 36.2 QP                 | 43.5           | -7.3        | 1.99 H             | 277                  | 55.10            | -18.90                   |
| 2   | 155.91      | 32.4 QP                 | 43.5           | -11.1       | 1.49 H             | 264                  | 45.90            | -13.50                   |
| 3   | 210.32      | 36.2 QP                 | 43.5           | -7.3        | 1.00 H             | 247                  | 52.30            | -16.10                   |
| 4   | 277.16      | 31.9 QP                 | 46.0           | -14.1       | 1.00 H             | 276                  | 44.80            | -12.90                   |
| 5   | 319.13      | 32.0 QP                 | 46.0           | -14.0       | 1.00 H             | 228                  | 43.70            | -11.70                   |
| 6   | 499.46      | 32.1 QP                 | 46.0           | -13.9       | 1.49 H             | 218                  | 40.50            | -8.40                    |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |             |                         |                |             |                    |                      |                  |                          |
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 47.10       | 36.9 QP                 | 40.0           | -3.1        | 1.25 V             | 15                   | 51.00            | -14.10                   |
| 2   | 98.40       | 33.1 QP                 | 43.5           | -10.4       | 2.00 V             | 197                  | 52.00            | -18.90                   |
| 3   | 199.44      | 31.3 QP                 | 43.5           | -12.2       | 1.00 V             | 11                   | 47.70            | -16.40                   |
| 4   | 249.18      | 29.9 QP                 | 46.0           | -16.1       | 1.25 V             | 184                  | 44.10            | -14.20                   |
| 5   | 334.68      | 30.1 QP                 | 46.0           | -15.9       | 1.25 V             | 166                  | 41.50            | -11.40                   |
| 6   | 452.82      | 29.4 QP                 | 46.0           | -16.6       | 1.25 V             | 105                  | 38.20            | -8.80                    |

**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

## 4.2 CONDUCTED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15 ~ 0.5                  | 66 to 56                     | 56 to 46 |
| 0.5 ~ 5                     | 56                           | 46       |
| 5 ~ 30                      | 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.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.         | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|---|--------------------------|--------------------|---------------------|-------------------------|
| Test Receiver<br>ROHDE & SCHWARZ        | ESCS30                   | 100288             | Apr. 24, 2014       | Apr. 23, 2015           |
| RF signal cable<br>Woken                | 5D-FB                    | Cable-HYCO2-0<br>1 | Dec. 27, 2013       | Dec. 26, 2014           |
| LISN<br>ROHDE & SCHWARZ<br>(EUT)        | ESH2-Z5                  | 100100             | Dec. 23, 2013       | Dec. 22, 2014           |
| LISN<br>ROHDE & SCHWARZ<br>(Peripheral) | ESH3-Z5                  | 100312             | Jul. 08, 2013       | Jul. 07, 2014           |
| Software<br>ADT                         | BV ADT_Cond_<br>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 HwaYa Shielded Room 2.
  3. The VCCI Site Registration No. is C-2047.

#### 4.2.3 TEST PROCEDURES

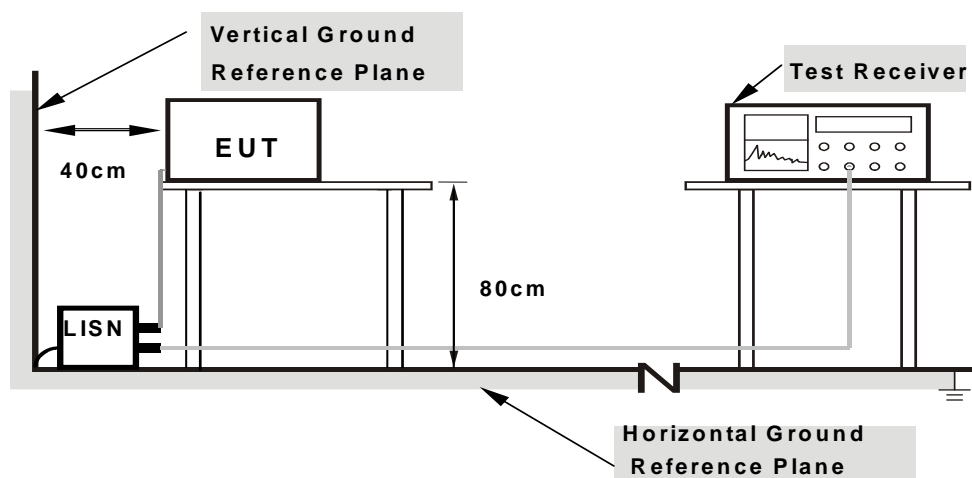
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

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

#### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

## 4.2.7 TEST RESULTS

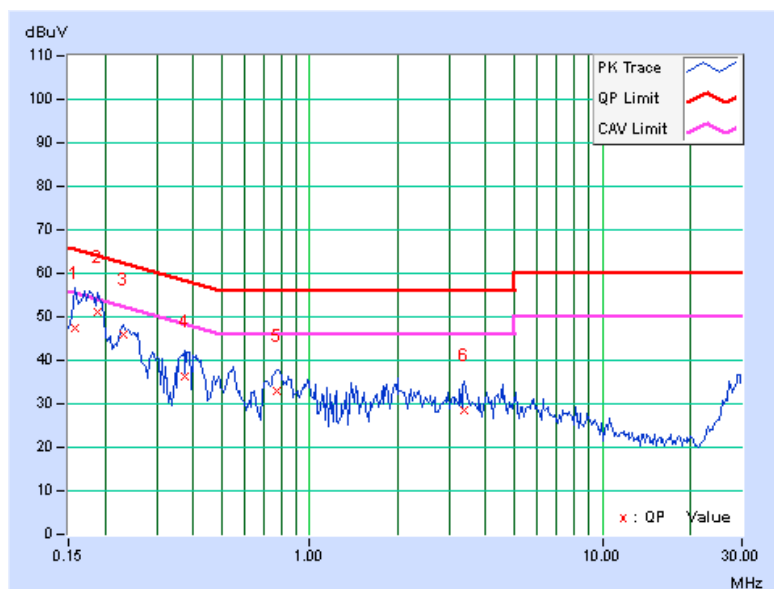
### CONDUCTED WORST-CASE DATA: 802.11n (40MHz)

|                  |        |                      |      |
|------------------|--------|----------------------|------|
| <b>PHASE</b>     | Line 1 | <b>6dB BANDWIDTH</b> | 9kHz |
| <b>TEST MODE</b> | A      |                      |      |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value<br>[dB (uV)] |         | Emission Level<br>[dB (uV)] |       | Limit<br>[dB (uV)] |       | Margin<br>(dB) |        |
|----|----------------|-------------------------|----------------------------|---------|-----------------------------|-------|--------------------|-------|----------------|--------|
|    |                |                         | Q.P.                       | AV.     | Q.P.                        | AV.   | Q.P.               | AV.   | Q.P.           | AV.    |
|    |                |                         | 1                          | 0.15781 | 0.27                        | 47.25 | 32.30              | 47.52 | 32.57          | 65.58  |
| 2  | 0.18906        | 0.28                    | 50.80                      | 33.93   | 51.08                       | 34.21 | 64.08              | 54.08 | -13.00         | -19.87 |
| 3  | 0.23203        | 0.28                    | 45.60                      | 33.65   | 45.88                       | 33.93 | 62.38              | 52.38 | -16.49         | -18.44 |
| 4  | 0.37266        | 0.30                    | 36.17                      | 25.85   | 36.47                       | 26.15 | 58.44              | 48.44 | -21.97         | -22.29 |
| 5  | 0.77500        | 0.33                    | 32.58                      | 22.38   | 32.91                       | 22.71 | 56.00              | 46.00 | -23.09         | -23.29 |
| 6  | 3.39063        | 0.41                    | 27.98                      | 20.99   | 28.39                       | 21.40 | 56.00              | 46.00 | -27.61         | -24.60 |

#### 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





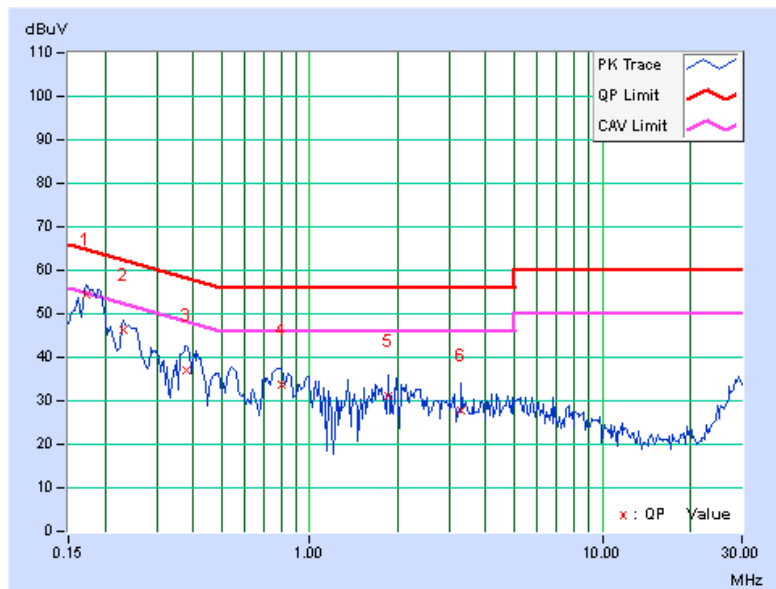
A D T

|           |        |               |      |
|-----------|--------|---------------|------|
| PHASE     | Line 2 | 6dB BANDWIDTH | 9kHz |
| TEST MODE | A      |               |      |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value<br>[dB (uV)] |         | Emission Level<br>[dB (uV)] |       | Limit<br>[dB (uV)] |       | Margin<br>(dB) |        |
|----|----------------|-------------------------|----------------------------|---------|-----------------------------|-------|--------------------|-------|----------------|--------|
|    |                |                         | Q.P.                       | AV.     | Q.P.                        | AV.   | Q.P.               | AV.   | Q.P.           | AV.    |
|    |                |                         | 1                          | 0.17344 | 0.27                        | 54.20 | 42.83              | 54.47 | 43.10          | 64.79  |
| 2  | 0.23203        | 0.28                    | 45.86                      | 33.96   | 46.14                       | 34.24 | 62.38              | 52.38 | -16.23         | -18.13 |
| 3  | 0.38047        | 0.30                    | 36.58                      | 24.94   | 36.88                       | 25.24 | 58.27              | 48.27 | -21.39         | -23.03 |
| 4  | 0.79844        | 0.33                    | 33.32                      | 21.43   | 33.65                       | 21.76 | 56.00              | 46.00 | -22.35         | -24.24 |
| 5  | 1.84766        | 0.37                    | 30.63                      | 22.12   | 31.00                       | 22.49 | 56.00              | 46.00 | -25.00         | -23.51 |
| 6  | 3.28516        | 0.41                    | 27.35                      | 20.03   | 27.76                       | 20.44 | 56.00              | 46.00 | -28.24         | -25.56 |

**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

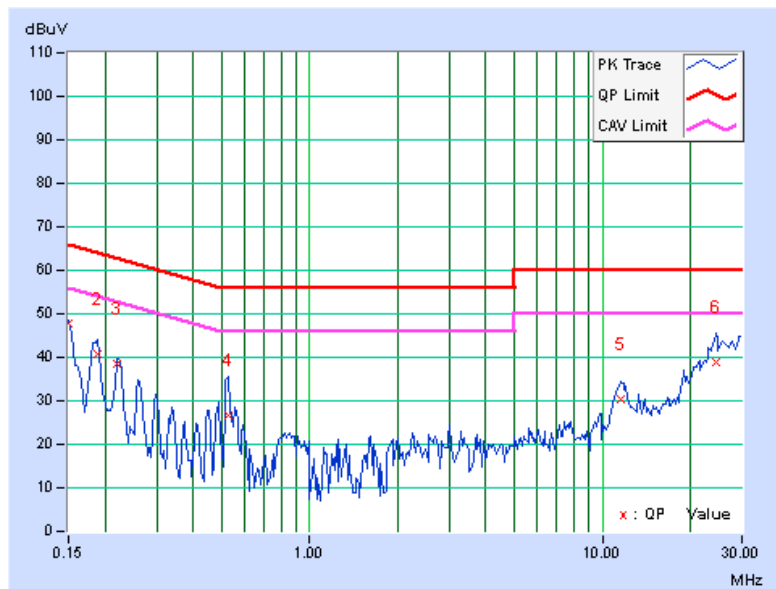


|                  |        |                      |      |
|------------------|--------|----------------------|------|
| <b>PHASE</b>     | Line 1 | <b>6dB BANDWIDTH</b> | 9kHz |
| <b>TEST MODE</b> | B      |                      |      |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value<br>[dB (uV)] |         | Emission Level<br>[dB (uV)] |       | Limit<br>[dB (uV)] |       | Margin<br>(dB) |        |
|----|----------------|-------------------------|----------------------------|---------|-----------------------------|-------|--------------------|-------|----------------|--------|
|    |                |                         | Q.P.                       | AV.     | Q.P.                        | AV.   | Q.P.               | AV.   | Q.P.           | AV.    |
|    |                |                         | 1                          | 0.15000 | 0.26                        | 47.40 | 37.64              | 47.66 | 37.90          | 66.00  |
| 2  | 0.18906        | 0.28                    | 40.63                      | 30.73   | 40.91                       | 31.01 | 64.08              | 54.08 | -23.17         | -23.07 |
| 3  | 0.22031        | 0.28                    | 38.07                      | 27.57   | 38.35                       | 27.85 | 62.81              | 52.81 | -24.46         | -24.96 |
| 4  | 0.52891        | 0.31                    | 26.21                      | 15.50   | 26.52                       | 15.81 | 56.00              | 46.00 | -29.48         | -30.19 |
| 5  | 11.49609       | 0.51                    | 29.91                      | 24.75   | 30.42                       | 25.26 | 60.00              | 50.00 | -29.58         | -24.74 |
| 6  | 24.40625       | 0.54                    | 38.51                      | 33.17   | 39.05                       | 33.71 | 60.00              | 50.00 | -20.95         | -16.29 |

**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





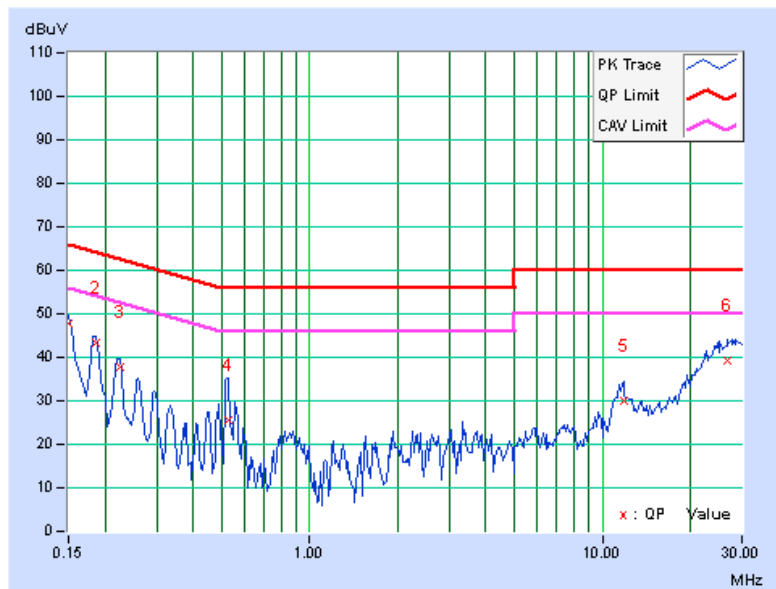
A D T

|                  |        |                      |      |
|------------------|--------|----------------------|------|
| <b>PHASE</b>     | Line 2 | <b>6dB BANDWIDTH</b> | 9kHz |
| <b>TEST MODE</b> | B      |                      |      |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value<br>[dB (uV)] |         | Emission Level<br>[dB (uV)] |       | Limit<br>[dB (uV)] |       | Margin<br>(dB) |        |
|----|----------------|-------------------------|----------------------------|---------|-----------------------------|-------|--------------------|-------|----------------|--------|
|    |                |                         | Q.P.                       | AV.     | Q.P.                        | AV.   | Q.P.               | AV.   | Q.P.           | AV.    |
|    |                |                         | 1                          | 0.15000 | 0.26                        | 47.46 | 38.10              | 47.72 | 38.36          | 66.00  |
| 2  | 0.18516        | 0.28                    | 43.05                      | 33.69   | 43.33                       | 33.97 | 64.25              | 54.25 | -20.93         | -20.29 |
| 3  | 0.22422        | 0.28                    | 37.32                      | 27.26   | 37.60                       | 27.54 | 62.66              | 52.66 | -25.06         | -25.12 |
| 4  | 0.52891        | 0.31                    | 25.11                      | 14.65   | 25.42                       | 14.96 | 56.00              | 46.00 | -30.58         | -31.04 |
| 5  | 11.79688       | 0.54                    | 29.60                      | 24.34   | 30.14                       | 24.88 | 60.00              | 50.00 | -29.86         | -25.12 |
| 6  | 26.75000       | 0.52                    | 38.79                      | 33.59   | 39.31                       | 34.11 | 60.00              | 50.00 | -20.69         | -15.89 |

**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. PHOTOGRAPHS OF THE TEST CONFIGURATION

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





## 6. 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.

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

## 7. APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

---END---