

## FCC Test Report (Co-Located)

**Report No.:** RF160321D09-2

**FCC ID:** K7SF9K1124V1

**Test Model:** F9K1124V1

**Received Date:** Mar. 21, 2016

**Test Date:** Mar. 23 ~ 30, 2016

**Issued Date:** Apr. 1, 2016

**Applicant:** Belkin International, Inc.

**Address:** 12045 East Waterfront Drive, Playa Vista, CA 90094 USA

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan (R.O.C.)



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### Release Control Record

| Issue No.     | Description       | Date Issued  |
|---------------|-------------------|--------------|
| RF160321D09-2 | Original release. | Apr. 1, 2016 |

## 1 Certificate of Conformity

**Product:** AC1900 DB Wi-Fi Dual-Band AC+ Gigabit Router

**Brand:** Belkin

**Test Model:** F9K1124V1

**Sample Status:** Engineering sample

**Applicant:** Belkin International, Inc.

**Test Date:** Mar. 23 ~ 30, 2016

**Standard:** 47 CFR FCC Part 15, Subpart E (Section 15.407)  
ANSI C63.10: 2013

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 :**



( Celia Chen / Supervisor )

**, Date:** Apr. 1, 2016

**Approved by :**



( Rex Lai / Assistant Manager )

**, Date:** Apr. 1, 2016

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart E (SECTION 15.407) |                                            |        |                                                                                    |
|------------------------------------------------|--------------------------------------------|--------|------------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                                  | Result | Remarks                                                                            |
| 15.207<br>15.407(b)(6)                         | AC Power Conducted Emissions               | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -6.25dB at 0.40391MHz. |
| 15.407(b)<br>(1/2/3/4/6)                       | Radiated Emissions & Band Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -1.0dB at 5860.01MHz.  |

### 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       | Expended Uncertainty (k=2) ( $\pm$ ) |
|------------------------------------|-----------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz  | 2.78 dB                              |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1000MHz | 4.00 dB                              |
| Radiated Emissions above 1 GHz     | 1GHz ~ 40GHz    | 3.36 dB                              |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                       |                                                                                                                                                                                                                                                                                                                  |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product               | AC1900 DB Wi-Fi Dual-Band AC+ Gigabit Router                                                                                                                                                                                                                                                                     |
| Brand                 | Belkin                                                                                                                                                                                                                                                                                                           |
| Test Model            | F9K1124V1                                                                                                                                                                                                                                                                                                        |
| Status of EUT         | Engineering sample                                                                                                                                                                                                                                                                                               |
| Power Supply Rating   | 12Vdc from Adapter                                                                                                                                                                                                                                                                                               |
| Modulation Type       | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>256QAM for OFDM in 11ac mode only.                                                                                                                                                                                                            |
| Modulation Technology | DSSS, OFDM                                                                                                                                                                                                                                                                                                       |
| Transfer Rate         | 802.11b: 11/5.5/2/1Mbps<br>802.11a/g: 54/48/36/24/18/12/9/6Mbps<br>802.11n: up to 600Mbps<br>802.11ac: up to 1300Mbps                                                                                                                                                                                            |
| Operating Frequency   | 2412 ~ 2462MHz<br>5180 ~ 5240MHz<br>5745 ~ 5825MHz                                                                                                                                                                                                                                                               |
| Number of Channel     | <b>2412 ~ 2462MHz</b><br>11 for 802.11b, 802.11g, 802.11n (HT20)<br>7 for 802.11n (HT40)<br><b>5180 ~ 5240MHz</b><br>4 for 802.11a, 802.11n (HT20)<br>2 for 802.11n (HT40)<br>1 for 802.11ac (VHT80)<br><b>5745 ~ 5825MHz</b><br>5 for 802.11a, 802.11n (HT20)<br>2 for 802.11n (HT40)<br>1 for 802.11ac (VHT80) |
| Output Power          | <b>2412 ~ 2462MHz</b><br>792.632mW<br><b>5180 ~ 5240MHz</b><br>293.129 mW<br><b>5745 ~ 5825MHz</b><br>406.579mW                                                                                                                                                                                                  |
| Antenna Type          | Refer to table as below                                                                                                                                                                                                                                                                                          |
| Antenna Connector     | Refer to table as below                                                                                                                                                                                                                                                                                          |
| Accessory Device      | Adapter                                                                                                                                                                                                                                                                                                          |
| Data Cable Supplied   | N/A                                                                                                                                                                                                                                                                                                              |
| Driver Version        | V1.04.03                                                                                                                                                                                                                                                                                                         |
| Product SW Version    | V1.04.03                                                                                                                                                                                                                                                                                                         |
| Product HW Version    | V1.0                                                                                                                                                                                                                                                                                                             |
| Radio SW Version      | V1.04.03                                                                                                                                                                                                                                                                                                         |
| Radio HW Version      | V1.0                                                                                                                                                                                                                                                                                                             |

Note:

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

| Modulation Mode  | TX FUNCTION |
|------------------|-------------|
| 802.11b          | 3TX         |
| 802.11g          | 3TX         |
| 802.11a          | 3TX         |
| 802.11n (20MHz)  | 3TX         |
| 802.11n (40MHz)  | 3TX         |
| 802.11ac (20MHz) | 3TX         |
| 802.11ac (40MHz) | 3TX         |
| 802.11ac (80MHz) | 3TX         |

\* The modulation and bandwidth are similar for 802.11n mode for 20MHz / 40MHz and 802.11ac mode for 20MHz / 40MHz, therefore investigated worst case to representative mode in test report. (Final test mode refer section 3.2.1)

2. The following antennas were applied to the EUT:

| Antenna | Brand   | Model     | Type    | Connector | Gain (dBi) |        |
|---------|---------|-----------|---------|-----------|------------|--------|
|         |         |           |         |           | 2.4GHz     | 5.0GHz |
| TX & RX |         |           |         |           |            |        |
| 1       | Airgain | N2420DG   | Printed | U.FL      | 2.71       | 3.05   |
| 2       | Airgain | N2420DGCS | Printed | U.FL      | 2.1        | 2.4    |
| 3       | Airgain | N2420DG   | Printed | U.FL      | 2.71       | 3.05   |
| RX      |         |           |         |           |            |        |
| 4       | Airgain | N5X20SD   | Printed | U.FL      | -          | 3.48   |

3. The EUT was power supplied from the following power adapters:

| Item      | Brand                                                                              | Model No.       | Design No.      | Plug Type | Rating                                                                          |
|-----------|------------------------------------------------------------------------------------|-----------------|-----------------|-----------|---------------------------------------------------------------------------------|
| Adapter 1 | Belkin                                                                             | MU24-Y120200-A1 | MU24-Y1120-AS1S | US        | AC I/P: 100-240V, 50/60Hz,<br>0.7A<br>DC O/P: 12V, 2A<br>Non-shielded DC (1.5m) |
|           | Belkin                                                                             | MU24-Y120200-C5 | MU24-Y1120-KS1S | EU        |                                                                                 |
|           | Belkin                                                                             | MU24-Y120200-A3 | MU24-Y1120-ES1S | AU        |                                                                                 |
|           | Belkin                                                                             | MU24-Y120200-B2 | MU24-Y1120-IS1S | UK        |                                                                                 |
|           | Four adapters are identical with each other except for their plug type difference  |                 |                 |           |                                                                                 |
| Adapter 2 | Belkin                                                                             | LW0NCA-US1220   |                 | US        | AC I/P: 100-240V, 50/60Hz,<br>0.6A<br>DC O/P: 12V, 2A<br>Non-shielded DC (1.5m) |
|           | Belkin                                                                             | LW0NCA-EU1220   |                 | EU        |                                                                                 |
|           | Belkin                                                                             | LW0NCA-UK1220   |                 | UK        |                                                                                 |
|           | Three adapters are identical with each other except for their plug type difference |                 |                 |           |                                                                                 |

After pre-tested above two adapters, the **Adapter 1** was the worst case, therefore, only its test data was recorded in this report.

4. 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

#### FOR 2412 ~ 2462MHz

11 channels are provided for 802.11b, 802.11g and 802.11n (20MHz):

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

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

| Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|
| 3       | 2422            | 7       | 2442            |
| 4       | 2427            | 8       | 2447            |
| 5       | 2432            | 9       | 2452            |
| 6       | 2437            |         |                 |



#### FOR 5180 ~ 5240MHz

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

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 36      | 5180 MHz  | 44      | 5220 MHz  |
| 40      | 5200 MHz  | 48      | 5240 MHz  |

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

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 38      | 5190 MHz  | 46      | 5230 MHz  |

1 channel is provided for 802.11ac (80MHz):

| Channel | Frequency |
|---------|-----------|
| 42      | 5210MHz   |

#### FOR 5745 ~ 5825MHz:

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

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 149     | 5745MHz   | 161     | 5805MHz   |
| 153     | 5765MHz   | 165     | 5825MHz   |
| 157     | 5785MHz   |         |           |

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

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 151     | 5755MHz   | 159     | 5795MHz   |

1 channel is provided for 802.11ac (80MHz):

| Channel | Frequency |
|---------|-----------|
| 155     | 5775MHz   |

### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO      |       |     | DESCRIPTION |
|--------------------|--------------------|-------|-----|-------------|
|                    | RE <sup>3</sup> 1G | RE<1G | PLC |             |
| -                  | √                  | √     | √   | -           |

Where **RE<sup>3</sup>1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission

#### **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.

| EUT CONFIGURE MODE | MODE             | FREQ. BAND (MHz)         | TESTED CHANNEL | MODULATION TECHNOLOGY |
|--------------------|------------------|--------------------------|----------------|-----------------------|
| -                  | 802.11g +802.11a | 2412 ~ 2462              | 1              | OFDM                  |
|                    |                  | 5180 ~ 5240, 5745 ~ 5825 | 159            | OFDM                  |

#### **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             | FREQ. BAND (MHz)         | TESTED CHANNEL | MODULATION TECHNOLOGY |
|--------------------|------------------|--------------------------|----------------|-----------------------|
| -                  | 802.11g +802.11a | 2412 ~ 2462              | 1              | OFDM                  |
|                    |                  | 5180 ~ 5240, 5745 ~ 5825 | 159            | OFDM                  |

#### **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             | FREQ. BAND (MHz)         | TESTED CHANNEL | MODULATION TECHNOLOGY |
|--------------------|------------------|--------------------------|----------------|-----------------------|
| -                  | 802.11g +802.11a | 2412 ~ 2462              | 1              | OFDM                  |
|                    |                  | 5180 ~ 5240, 5745 ~ 5825 | 159            | OFDM                  |

#### **Test Condition:**

| APPLICABLE TO      | ENVIRONMENTAL CONDITIONS | INPUT POWER  | TESTED BY |
|--------------------|--------------------------|--------------|-----------|
| RE <sup>3</sup> 1G | 20deg. C, 70%RH          | 120Vac, 60Hz | Aaron You |
| RE<1G              | 22deg. C, 67%RH          | 120Vac, 60Hz | Aaron You |
| PLC                | 23deg. C, 73%RH          | 120Vac, 60Hz | Aaron You |

### 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.

| ID | Product           | Brand  | Model No.          | Serial No.   | FCC ID           | Remarks         |
|----|-------------------|--------|--------------------|--------------|------------------|-----------------|
| A. | USB 3.0 Hard Disk | WD     | WDBACY5000ABL-PESN | WXD1E91JMPR4 | FCC DoC Approved | Provided by Lab |
| B. | LAN Load          | NA     | NA                 | NA           | NA               | Provided by Lab |
| C. | Notebook PC       | DELL   | E6530              | 9331GV1      | FCC DoC Approved | Provided by Lab |
| D. | Notebook PC       | DELL   | PP27L              | 8SNZ12S      | FCC DoC Approved | Provided by Lab |
| E. | Notebook PC       | DELL   | E5410              | BW33YM1      | FCC DoC Approved | Provided by Lab |
| F. | Notebook PC       | Lenovo | L440               | R90HE6YK     | FCC DoC Approved | Provided by Lab |

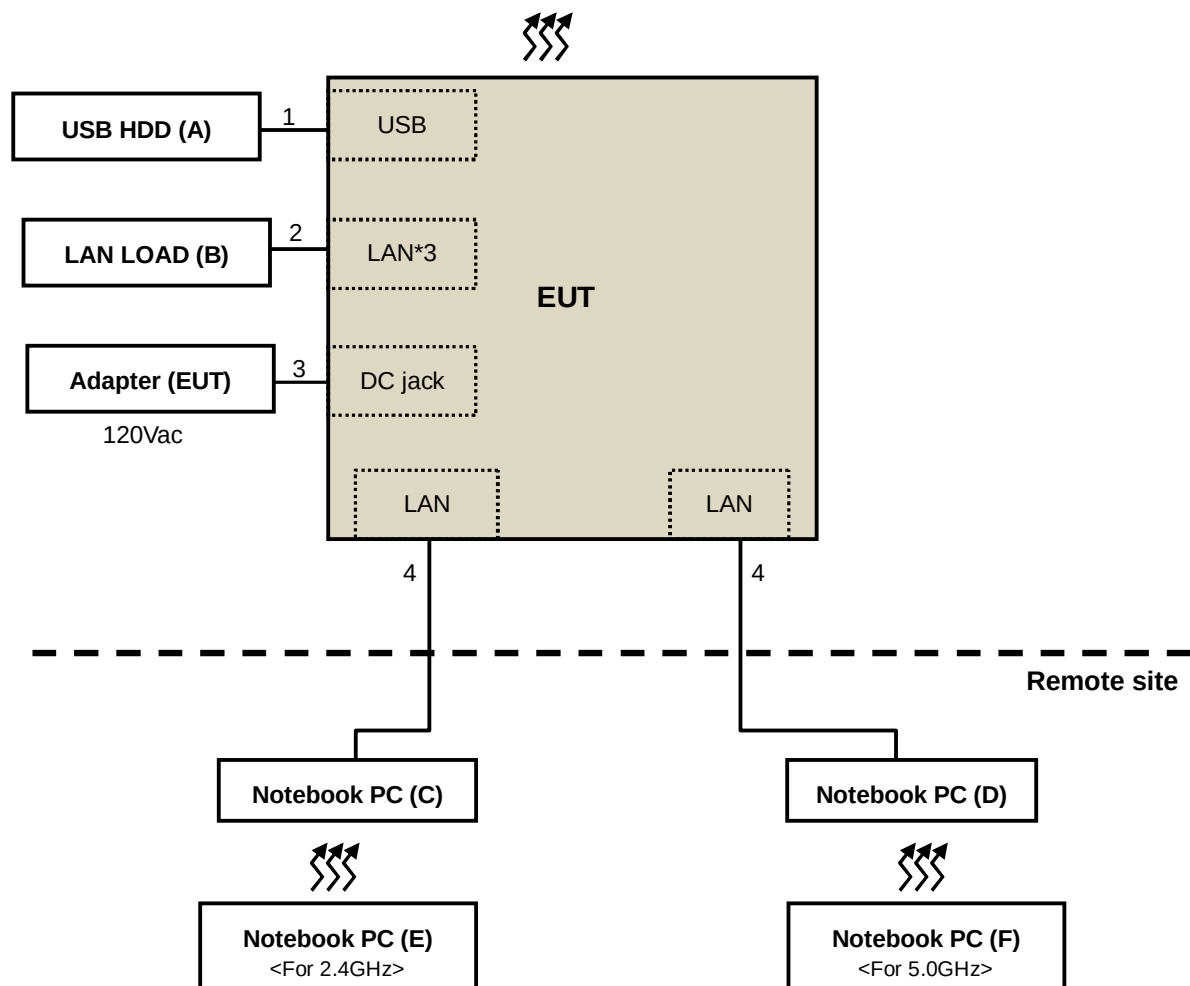
Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Items C~F acted as communication partners to transfer data.

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks            |
|----|--------------|------|------------|--------------------|--------------|--------------------|
| 1. | USB cable    | 1    | 0.5        | Y                  | 0            | Provided by Lab    |
| 2. | LAN cable    | 3    | 1.8        | N                  | 0            | Provided by Lab    |
| 3. | DC cable     | 1    | 1.5        | N                  | 0            | Supplied by client |
| 4. | LAN cable    | 2    | 10         | N                  | 0            | Provided by Lab    |

Note: The core(s) is(are) originally attached to the cable(s).

### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standard

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 E (15.407)**  
**KDB 789033 D02 General UNII Test Procedure New Rules v01r01**  
**KDB 662911 D01 Multiple Transmitter Output v02r01**  
**FCC Part 15, Subpart C (15.247)**  
**KDB 558074 D01 DTS Meas Guidance v03r04**  
**KDB 662911 D01 Multiple Transmitter Output v02r01**  
**ANSI C63.10-2013**

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

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 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 (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:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = 20 log Emission level (uV/m).
- 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.

#### LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

| APPLICABLE TO                                        | LIMIT                                                            |                                                                  |
|------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------|
| 789033 D02 General UNII Test Procedure New Rules v01 | FIELD STRENGTH AT 3m                                             |                                                                  |
|                                                      | PK:74 (dBuV/m)                                                   | AV:54 (dBuV/m)                                                   |
| APPLICABLE TO                                        | EIRP LIMIT                                                       | EQUIVALENT FIELD STRENGTH AT 3m                                  |
| 15.407(b)(1)                                         | PK:-27 (dBm/MHz)                                                 | PK:68.2(dBuV/m)                                                  |
| 15.407(b)(2)                                         |                                                                  |                                                                  |
| 15.407(b)(3)                                         |                                                                  |                                                                  |
| 15.407(b)(4)                                         | PK:-27 (dBm/MHz) <sup>*1</sup><br>PK:-17 (dBm/MHz) <sup>*2</sup> | PK: 68.2(dBuV/m) <sup>*1</sup><br>PK:78.2 (dBuV/m) <sup>*2</sup> |

**NOTE:** <sup>\*1</sup> beyond 10MHz of the band edge <sup>\*2</sup> within 10 MHz of band edge

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3} \mu\text{V/m, where P is the eirp (Watts).}$$

#### 4.1.2 Test Instruments

| DESCRIPTION & MANUFACTURER                    | MODEL NO.            | SERIAL NO.     | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------------------|----------------------|----------------|-----------------|------------------|
| HP Preamplifier                               | 8447D                | 2432A03504     | Feb. 26, 2016   | Feb. 25, 2017    |
| HP Preamplifier                               | 8449B                | 3008A01201     | Feb. 26, 2016   | Feb. 25, 2017    |
| MITEQ Preamplifier                            | AMF-6F-260400-33-8P  | 892164         | Mar. 01, 2016   | Feb. 28, 2017    |
| Agilent<br>TEST RECEIVER                      | N9038A               | MY51210129     | Feb. 02, 2016   | Feb. 01, 2017    |
| Schwarzbeck Antenna                           | VULB 9168            | 139            | Jan. 04, 2016   | Jan. 03, 2017    |
| Schwarzbeck Antenna                           | VHBA 9123            | 480            | May 29, 2015    | May 28, 2017     |
| Schwarzbeck Horn<br>Antenna                   | BBHA-9170            | 212            | Jan. 08, 2016   | Jan. 07, 2017    |
| Schwarzbeck Horn<br>Antenna                   | BBHA 9120-D1         | D130           | Jan. 21, 2016   | Jan. 20, 2017    |
| ADT. Turn Table                               | TT100                | 0306           | NA              | NA               |
| ADT. Tower                                    | AT100                | 0306           | NA              | NA               |
| Software                                      | Radiated_V7.6.15.9.4 | NA             | NA              | NA               |
| SUHNER RF cable<br>With 4dB PAD               | SF104                | CABLE-CH6      | Aug. 15, 2015   | Aug. 14, 2016    |
| SUHNER RF cable<br>With 3dB PAD               | SF102                | Cable-CH8-3.6m | Aug. 15, 2015   | Aug. 14, 2016    |
| KEYSIGHT MIMO<br>Powermeasurement Test<br>set | U2021XA              | U2021XA-001    | May 04, 2015    | May 03, 2016     |
| KEYSIGHT<br>Spectrum Analyzer                 | N9030A               | MY54490260     | Jul. 14, 2015   | Jul. 13, 2016    |
| EMCO Horn Antenna                             | 3115                 | 00028257       | Jan. 19, 2016   | Jan. 18, 2017    |
| Highpass filter<br>Wainwright Instruments     | WHK 3.1/18G-10SS     | SN 8           | NA              | NA               |
| ROHDE & SCHWARZ<br>Spectrum Analyzer          | FSV40                | 101042         | Sep. 23, 2015   | Sep. 22, 2016    |
| Anritsu<br>Power Sensor                       | MA2411B              | 0738404        | Apr. 21, 2015   | Apr. 20, 2016    |
| Anritsu<br>Power Meter                        | ML2495A              | 0842014        | Apr. 21, 2015   | Apr. 20, 2016    |

- NOTE:**
1. The calibration interval of the above test instruments is 12/24 months. And the calibrations are traceable to NML/ROC and NIST/USA.
  2. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  3. The test was performed in Chamber No. 6.
  4. The Industry Canada Reference No. IC 7450E-6.
  5. The FCC Site Registration No. is 447212.

#### 4.1.3 Test Procedure

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) 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. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. 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.
3. All modes of operation were investigated and the worst-case emissions are reported.

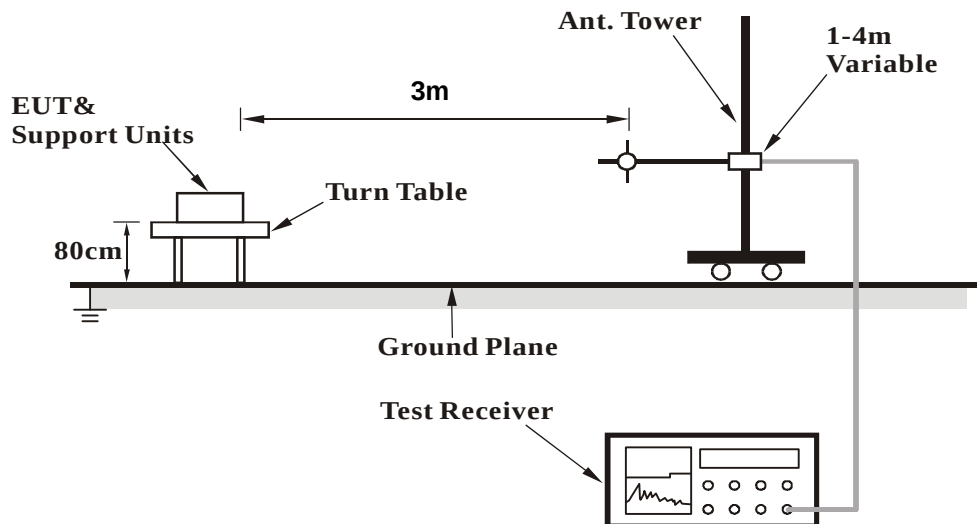
#### 4.1.4 Deviation from Test Standard

No deviation.

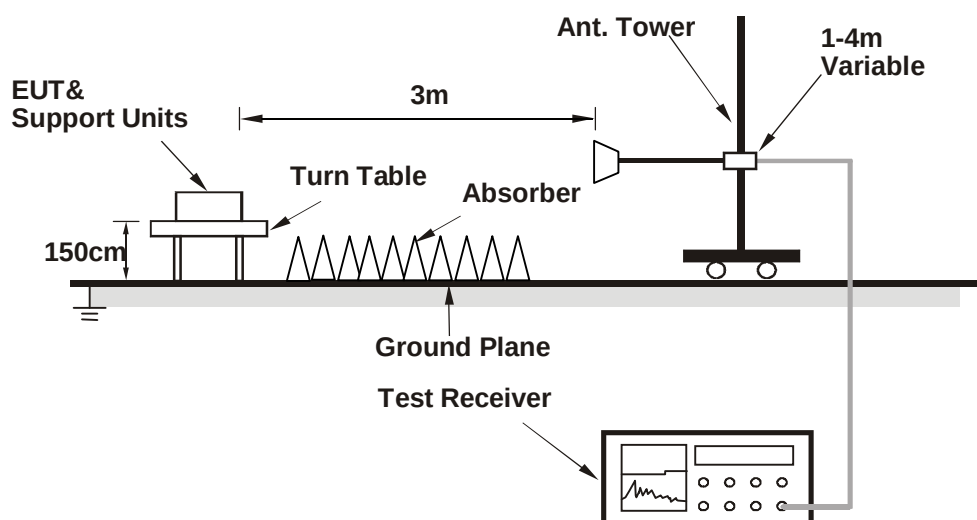


#### 4.1.5 Test Setup

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



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



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

#### 4.1.6 EUT Operating Condition

- Placed the EUT on the testing table.
- Prepared notebook to act as communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".
- The necessary accessories enable the system in full functions.

#### 4.1.7 Test Results

#### ABOVE 1GHz DATA

|                        |                    |                              |              |
|------------------------|--------------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 1 + 159 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 40GHz       |                              | 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        | 71.3 PK                       | 74.0              | -2.7           | 2.58 H                   | 267                        | 70.13                  | 1.19                           |
| 2                                                   | 2390.00        | 52.8 AV                       | 54.0              | -1.2           | 2.58 H                   | 267                        | 51.60                  | 1.19                           |
| 3                                                   | *2412.00       | 115.8 PK                      |                   |                | 2.58 H                   | 267                        | 114.49                 | 1.34                           |
| 4                                                   | *2412.00       | 105.4 AV                      |                   |                | 2.58 H                   | 267                        | 104.06                 | 1.34                           |
| 5                                                   | 4824.00        | 48.7 PK                       | 74.0              | -25.3          | 1.79 H                   | 300                        | 40.85                  | 7.84                           |
| 6                                                   | 4824.00        | 34.6 AV                       | 54.0              | -19.4          | 1.79 H                   | 300                        | 26.78                  | 7.84                           |
| 7                                                   | *5795.00       | 108.9 PK                      |                   |                | 2.88 H                   | 288                        | 98.65                  | 10.24                          |
| 8                                                   | *5795.00       | 98.7 AV                       |                   |                | 2.88 H                   | 288                        | 88.46                  | 10.24                          |
| 9                                                   | #5850.00       | 71.6 PK                       | 78.2              | -6.6           | 2.88 H                   | 288                        | 61.34                  | 10.29                          |
| 10                                                  | #5860.01       | 67.2 PK                       | 68.2              | -1.0           | 2.88 H                   | 288                        | 56.88                  | 10.30                          |
| 11                                                  | 11590.00       | 63.7 PK                       | 74.0              | -10.3          | 1.63 H                   | 280                        | 41.32                  | 22.37                          |
| 12                                                  | 11590.00       | 52.5 AV                       | 54.0              | -1.6           | 1.63 H                   | 280                        | 30.08                  | 22.37                          |
| 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        | 68.1 PK                       | 74.0              | -5.9           | 2.69 V                   | 283                        | 66.88                  | 1.19                           |
| 2                                                   | 2390.00        | 50.0 AV                       | 54.0              | -4.0           | 2.69 V                   | 283                        | 48.79                  | 1.19                           |
| 3                                                   | *2412.00       | 113.9 PK                      |                   |                | 2.69 V                   | 283                        | 112.56                 | 1.34                           |
| 4                                                   | *2412.00       | 104.7 AV                      |                   |                | 2.69 V                   | 283                        | 103.38                 | 1.34                           |
| 5                                                   | 4824.00        | 46.5 PK                       | 74.0              | -27.5          | 1.33 V                   | 200                        | 38.69                  | 7.84                           |
| 6                                                   | 4824.00        | 33.2 AV                       | 54.0              | -20.8          | 1.33 V                   | 200                        | 25.33                  | 7.84                           |
| 7                                                   | *5795.00       | 104.4 PK                      |                   |                | 1.72 V                   | 275                        | 94.14                  | 10.24                          |
| 8                                                   | *5795.00       | 95.7 AV                       |                   |                | 1.72 V                   | 275                        | 85.44                  | 10.24                          |
| 9                                                   | #5850.00       | 62.9 PK                       | 78.2              | -15.3          | 1.72 V                   | 275                        | 52.59                  | 10.29                          |
| 10                                                  | #5860.01       | 62.3 PK                       | 68.2              | -5.9           | 1.72 V                   | 275                        | 52.03                  | 10.30                          |
| 11                                                  | 11590.00       | 62.3 PK                       | 74.0              | -11.7          | 2.28 V                   | 251                        | 39.93                  | 22.37                          |
| 12                                                  | 11590.00       | 50.3 AV                       | 54.0              | -3.7           | 2.28 V                   | 251                        | 27.92                  | 22.37                          |

#### REMARKS:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value
- " \* ": Fundamental frequency.
- " # ": The radiated frequency is out of the restricted band.

# BELOW 1GHz DATA

|                 |                    |                      |                 |
|-----------------|--------------------|----------------------|-----------------|
| CHANNEL         | TX Channel 1 + 159 | DETECTOR<br>FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 30MHz ~ 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                                                   | 30.44          | 32.0 QP                       | 40.0              | -8.0           | 4.00 H                   | 91                         | 43.50                  | -11.49                         |
| 2                                                   | 70.35          | 32.0 QP                       | 40.0              | -8.0           | 4.00 H                   | 227                        | 43.43                  | -11.40                         |
| 3                                                   | 98.14          | 33.4 QP                       | 43.5              | -10.1          | 4.00 H                   | 252                        | 47.86                  | -14.47                         |
| 4                                                   | 163.47         | 32.1 QP                       | 43.5              | -11.4          | 3.81 H                   | 250                        | 41.48                  | -9.35                          |
| 5                                                   | 223.61         | 32.9 QP                       | 46.0              | -13.1          | 2.94 H                   | 79                         | 44.71                  | -11.81                         |
| 6                                                   | 579.99         | 39.6 QP                       | 46.0              | -6.4           | 1.36 H                   | 104                        | 41.64                  | -2.05                          |
| 7                                                   | 901.88         | 37.4 QP                       | 46.0              | -8.6           | 1.00 H                   | 81                         | 34.04                  | 3.34                           |
| 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                                                   | 35.26          | 38.7 QP                       | 40.0              | -1.3           | 1.33 V                   | 131                        | 49.76                  | -11.03                         |
| 2                                                   | 62.64          | 37.9 QP                       | 40.0              | -2.1           | 1.25 V                   | 0                          | 48.30                  | -10.39                         |
| 3                                                   | 125.01         | 36.7 QP                       | 43.5              | -6.9           | 1.00 V                   | 125                        | 48.13                  | -11.48                         |
| 4                                                   | 258.14         | 31.6 QP                       | 46.0              | -14.4          | 2.06 V                   | 121                        | 40.88                  | -9.25                          |
| 5                                                   | 386.72         | 31.0 QP                       | 46.0              | -15.0          | 2.43 V                   | 111                        | 36.80                  | -5.81                          |
| 6                                                   | 575.53         | 37.7 QP                       | 46.0              | -8.3           | 2.88 V                   | 136                        | 39.80                  | -2.10                          |
| 7                                                   | 966.68         | 36.6 QP                       | 54.0              | -17.5          | 3.17 V                   | 116                        | 31.54                  | 5.01                           |

## 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 (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.

### 4.2.2 Test Instruments

| Description & Manufacturer                                       | Model No.   | Serial No.   | Cal. Date     | Cal. Due      |
|------------------------------------------------------------------|-------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ<br>TEST RECEIVER                                 | ESCS 30     | 100276       | Apr. 01, 2015 | Mar. 31, 2016 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for EUT)         | ENV216      | 101197       | Apr. 27, 2015 | Apr. 26, 2016 |
| LISN With Adapter<br>(for EUT)                                   | AD10        | C10Ada-002   | Apr. 27, 2015 | Apr. 26, 2016 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for peripherals) | ESH3-Z5     | 100218       | Nov. 25, 2015 | Nov. 24, 2016 |
| SCHWARZBECK<br>Artificial Mains Network (For<br>EUT)             | NNLK8129    | 8129229      | May 06, 2015  | May 05, 2016  |
| Software                                                         | Cond_V7.3.7 | NA           | NA            | NA            |
| RF cable (JYEBAO)<br>With 10dB PAD                               | 5D-FB       | Cable-C10.01 | Feb. 15, 2016 | Feb. 14, 2017 |
| SUHNTER Terminator<br>(For ROHDE & SCHWARZ<br>LISN)              | 65BNC-5001  | E1-011484    | May 19, 2015  | May 18, 2016  |
| ROHDE & SCHWARZ<br>Artificial Mains Network (For<br>TV EUT)      | ESH3-Z5     | 100220       | Nov. 13, 2015 | Nov. 12, 2016 |
| LISN With Adapter<br>(for TV EUT)                                | 100220      | N/A          | Nov. 13, 2015 | Nov. 12, 2016 |

Notes: 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. 10.

3. The VCCI Site Registration No. C-1852.

#### 4.2.3 Test Procedure

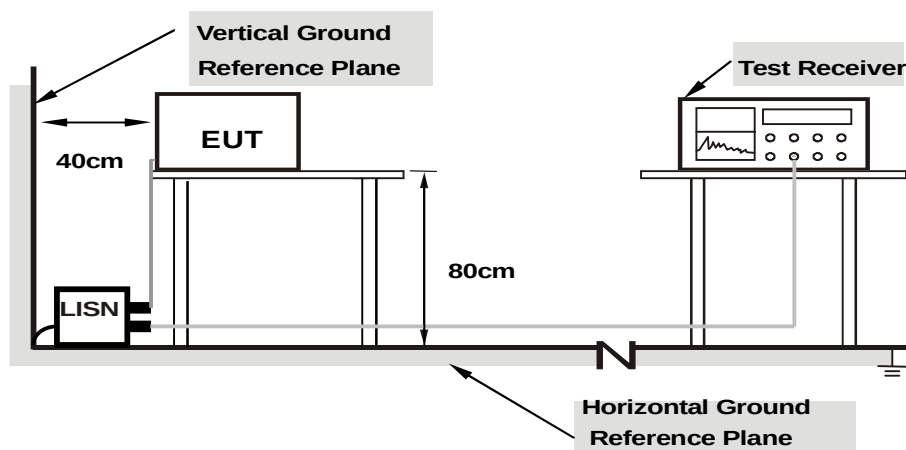
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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:** 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 Condition

Same as 4.1.6.

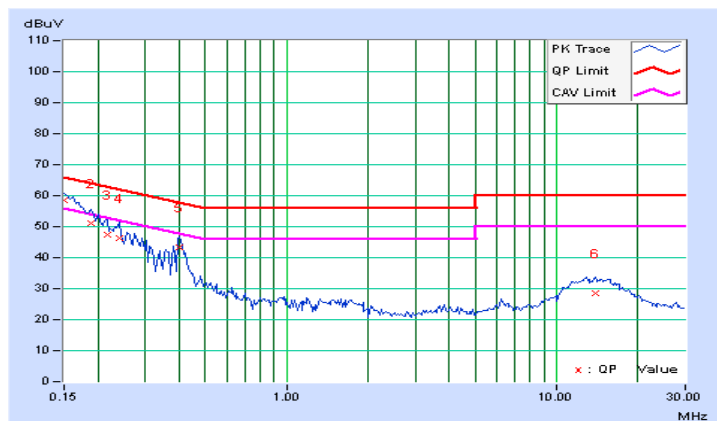
#### 4.2.7 Test Results

| 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  | 0.15001         | 9.66                   | 48.99                | 36.02 | 58.65                 | 45.68 | 66.00        | 56.00 | -7.35       | -10.32 |
| 2  | 0.18906         | 9.65                   | 41.40                | 28.79 | 51.05                 | 38.44 | 64.08        | 54.08 | -13.03      | -15.64 |
| 3  | 0.21641         | 9.65                   | 37.63                | 25.90 | 47.28                 | 35.55 | 62.96        | 52.96 | -15.67      | -17.40 |
| 4  | 0.23984         | 9.66                   | 36.72                | 26.15 | 46.38                 | 35.81 | 62.10        | 52.10 | -15.73      | -16.30 |
| 5  | 0.40000         | 9.68                   | 33.83                | 31.33 | 43.51                 | 41.01 | 57.85        | 47.85 | -14.34      | -6.84  |
| 6  | 13.87500        | 10.19                  | 18.35                | 13.54 | 28.54                 | 23.73 | 60.00        | 50.00 | -31.46      | -26.27 |

#### 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

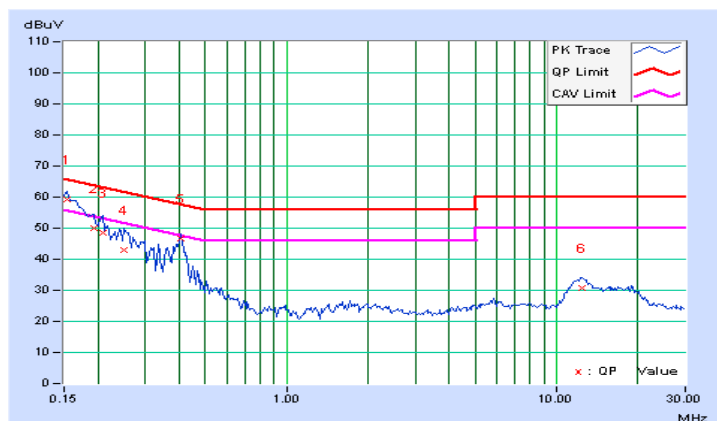


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| 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  | 0.15391         | 9.69                   | 49.45                | 36.42        | 59.14                 | 46.11        | 65.79        | 55.79        | -6.65         | -9.68        |
| 2  | 0.19297         | 9.69                   | 40.37                | 28.65        | 50.06                 | 38.34        | 63.91        | 53.91        | -13.85        | -15.57       |
| 3  | 0.20859         | 9.69                   | 38.73                | 25.90        | 48.42                 | 35.59        | 63.26        | 53.26        | -14.84        | -17.67       |
| 4  | 0.25156         | 9.70                   | 33.28                | 23.01        | 42.98                 | 32.71        | 61.71        | 51.71        | -18.73        | -19.00       |
| 5  | <b>0.40391</b>  | <b>9.72</b>            | <b>36.91</b>         | <b>31.80</b> | <b>46.63</b>          | <b>41.52</b> | <b>57.77</b> | <b>47.77</b> | <b>-11.14</b> | <b>-6.25</b> |
| 6  | 12.39844        | 10.25                  | 20.41                | 15.17        | 30.66                 | 25.42        | 60.00        | 50.00        | -29.34        | -24.58       |

#### 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).



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

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