

## FCC Test Report

**Report No.:** RF170905C13A

**FCC ID:** PY317200377

**Test Model:** RBS50Y

**Received Date:** Sep. 05, 2017

**Test Date:** May 04 ~ May 23, 2018

**Issued Date:** May 29, 2018

**Applicant:** NETGEAR, INC.

**Address:** 350 East Plumeria Drive San Jose, CA 95134

**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.)

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN (R.O.C.)

**FCC Registration /  
Designation Number:** 788550 / TW0003



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### Release Control Record

| Issue No.    | Description       | Date Issued  |
|--------------|-------------------|--------------|
| RF170905C13A | Original release. | May 29, 2018 |

## 1 Certificate of Conformity

**Product:** Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System

**Brand:** NETGEAR

**Test Model:** RBS50Y

**Sample Status:** Engineering sample

**Applicant:** NETGEAR, INC.

**Test Date:** May 04 ~ May 23, 2018

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
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 RF characteristics under the conditions specified in this report.

**Prepared by :** Celine Chou , **Date:** May 29, 2018  
Celine Chou / Specialist

**Approved by :** Bruce Chen , **Date:** May 29, 2018  
Bruce Chen / Project Engineer

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.247) |                                              |        |                                                                                  |
|------------------------------------------------|----------------------------------------------|--------|----------------------------------------------------------------------------------|
| FCC Clause                                     | Test Item                                    | Result | Remarks                                                                          |
| 15.207                                         | AC Power Conducted Emission                  | Pass   | Meet the requirement of limit. Minimum passing margin is -12.96dB at 0.15000MHz. |
| 15.205 / 15.209 / 15.247(d)                    | Radiated Emissions and Band Edge Measurement | Pass   | Meet the requirement of limit. Minimum passing margin is -0.2dB at 2483.50MHz.   |
| 15.247(d)                                      | Antenna Port Emission                        | NA     | Refer to Note below.                                                             |
| 15.247(a)(2)                                   | 6dB bandwidth                                | NA     | Refer to Note below.                                                             |
| 15.247(b)                                      | Conducted power                              | NA     | Refer to Note below.                                                             |
| 15.247(e)                                      | Power Spectral Density                       | NA     | Refer to Note below.                                                             |
| 15.203                                         | Antenna Requirement                          | Pass   | Antenna connector is i-pex (MHF) not a standard connector.                       |

Note: The radiated emission had been an addendum test. Refer to original report for the other test data.

### 2.1 Measurement Uncertainty

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

| Measurement                        | Frequency        | Expanded Uncertainty (k=2) ( $\pm$ ) |
|------------------------------------|------------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz   | 2.94 dB                              |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 200MHz   | 3.63 dB                              |
|                                    | 200MHz ~ 1000MHz | 3.64 dB                              |
| Radiated Emissions above 1 GHz     | 1GHz ~ 18GHz     | 2.29 dB                              |
|                                    | 18GHz ~ 40GHz    | 2.29 dB                              |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                       |                                                                                         |
|-----------------------|-----------------------------------------------------------------------------------------|
| Product               | Orbi Router, Orbi Satellite, Orbi AC3000 Tri-band WiFi System                           |
| Brand                 | NETGEAR                                                                                 |
| Test Model            | RBS50Y                                                                                  |
| Sample Status         | Engineering sample                                                                      |
| Power Supply Rating   | 12Vdc from adapter                                                                      |
| Modulation Type       | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM                         |
| Modulation Technology | DSSS, OFDM                                                                              |
| Transfer Rate         | 802.11b: 11/5.5/2/1Mbps<br>802.11g: 54/48/36/24/18/12/9/6Mbps<br>802.11n: up to 300Mbps |
| Operating Frequency   | 2412 ~ 2462MHz                                                                          |
| Number of Channel     | 802.11b, 802.11g, 802.11n (HT20): 11<br>802.11n (HT40): 7                               |
| Output Power          | CDD Mode: 819.478mW<br>Beamforming Mode: 569.557mW                                      |
| Antenna Type          | Refer to Note                                                                           |
| Antenna Connector     | Refer to Note                                                                           |
| Accessory Device      | Adapter                                                                                 |
| Cable Supplied        | N/A                                                                                     |

**Note:**

1. This report is prepared for FCC class II permissive change. The differences compared with the original report (BV CPS report no.: RF170906C13) is adding 2nd source. After evaluation, only the radiated emission and power line conducted emission of 802.11n (HT40) channel 6 has been an addendum test. Refer to original report for the other test data.
2. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

| Modulation Mode | Beamforming Mode     | TX Function |
|-----------------|----------------------|-------------|
| 802.11b         | Not Support          | 2TX         |
| 802.11g         | Not Support          | 2TX         |
| 802.11n (HT20)  | Support (CDD / NSS1) | 2TX         |
| 802.11n (HT40)  | Support (CDD / NSS1) | 2TX         |

\* For 802.11n, CDD mode and Beamforming mode are presented in power output test item. For other test items, CDD mode is the worst case for final tests after pretesting.

3. The following RF Modules are for the EUT. (New source are marked in boldface)

| Brand   | Model  | RF Module | Band    |
|---------|--------|-----------|---------|
| NETGEAR | RBS50Y | Module 1  | 2.4G    |
|         |        |           | UNII-1  |
|         |        |           | UNII-2A |
|         |        | Module 2  | UNII-2C |
|         |        |           | UNII-3  |
|         |        | BT Module | BT LE   |

| RF Module | Filter     | Position                       | Remark                              |
|-----------|------------|--------------------------------|-------------------------------------|
| Module 1  | 1st        | TFL1,TFL2                      | pin to pin & Same design            |
|           | <b>2nd</b> | <b>TFL1,TFL2</b>               | <b>pin to pin &amp; Same design</b> |
| Module 2  | 1st        | BHPF1,BHPF2,BHPF3,BHPF4        | pin to pin & Same design            |
|           | <b>2nd</b> | <b>BHPF1,BHPF2,BHPF3,BHPF4</b> | <b>pin to pin &amp; Same design</b> |

| RF Module | RF Switch  | Position               | Remark                              |
|-----------|------------|------------------------|-------------------------------------|
| Module 1  | 1st        | AS1,AS2,TS1,TS2        | pin to pin & Same design            |
|           | <b>2nd</b> | <b>AS1,AS2,TS1,TS2</b> | <b>pin to pin &amp; Same design</b> |

4. The EUT uses following antennas.

|                                |            |        |         |         |        |
|--------------------------------|------------|--------|---------|---------|--------|
| Ant. Type                      | Dipole     |        |         |         |        |
| Connector Type                 | i-pex(MHF) |        |         |         |        |
| Directional Antenna Gain (dBi) |            |        |         |         |        |
| Item                           | 2.4G       | UNII-1 | UNII-2A | UNII-2C | UNII-3 |
| -                              | 5.31       | 5.97   | 5.41    | 8.74    | 7.57   |

5. The EUT consumes power from the following adapters.

|                |                                                 |
|----------------|-------------------------------------------------|
| Adapter 1 (US) |                                                 |
| Brand          | NETGEAR                                         |
| Model          | AD2110F10                                       |
| P/N            | 332-10999-01                                    |
| Input Power    | 100-120Vac, 50/60Hz, 1.0A                       |
| Output Power   | 12Vdc, 2.5A                                     |
| Power Line     | 3m power cable without core attached on adapter |

|                |                                                 |
|----------------|-------------------------------------------------|
| Adapter 2 (US) |                                                 |
| Brand          | NETGEAR                                         |
| Model          | 2ADF030F1 NA                                    |
| P/N            | 332-11000-01                                    |
| Input Power    | 100-120Vac, 50/60Hz, 1.0A                       |
| Output Power   | 12Vdc, 2.5A                                     |
| Power Line     | 3m power cable without core attached on adapter |

\* After pre- test, adapter 1 was chosen for final test and presented in the test report.

6. Spurious emission of the simultaneous operation mode as below and the test data please refer to report no.: RF170905C13A-2.

| No | Mode                                                    |
|----|---------------------------------------------------------|
| 1  | WLAN 2.4GHz + WLAN 5GHz B1 (2TX) + WLAN 5GHz B3 + BT LE |
| 2  | WLAN 2.4GHz + WLAN 5GHz B2 + WLAN 5GHz B3 + BT LE       |
| 3  | WLAN 2.4GHz + WLAN 5GHz B2 + WLAN 5GHz B4 + BT LE       |

### 3.2 Description of Test Modes

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

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

7 channels are provided for 802.11n (HT40):

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



### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT Configure Mode | Applicable to |       |     | Description |
|--------------------|---------------|-------|-----|-------------|
|                    | RE $\geq$ 1G  | RE<1G | PLC |             |
| -                  | √             | √     | √   | -           |

Where RE $\geq$ 1G: Radiated Emission above 1GHz & Bandedge Measurement  
 RE<1G: Radiated Emission below 1GHz  
 PLC: Power Line Conducted Emission  
 APCM: Antenna Port Conducted Measurement

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

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

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

| EUT Configure Mode | Mode           | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| -                  | 802.11n (HT40) | 3 to 9            | 6              | OFDM                  | BPSK            | 13.5             |

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

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

| EUT Configure Mode | Mode           | Available Channel | Tested Channel | Modulation Technology | Modulation Type | Data Rate (Mbps) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| -                  | 802.11n (HT40) | 3 to 9            | 6              | OFDM                  | BPSK            | 13.5             |

#### **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) |
|--------------------|----------------|-------------------|----------------|-----------------------|-----------------|------------------|
| -                  | 802.11n (HT40) | 3 to 9            | 6              | OFDM                  | BPSK            | 13.5             |

#### **Test Condition:**

| Applicable to | Environmental Conditions | Input Power  | Tested by  |
|---------------|--------------------------|--------------|------------|
| RE $\geq$ 1G  | 25 deg. C, 70% RH        | 120Vac, 60Hz | Noah Chang |
| RE<1G         | 25 deg. C, 70% RH        | 120Vac, 60Hz | Luis Lee   |
| PLC           | 25 deg. C, 71% RH        | 120Vac, 60Hz | Luis Lee   |

### 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.

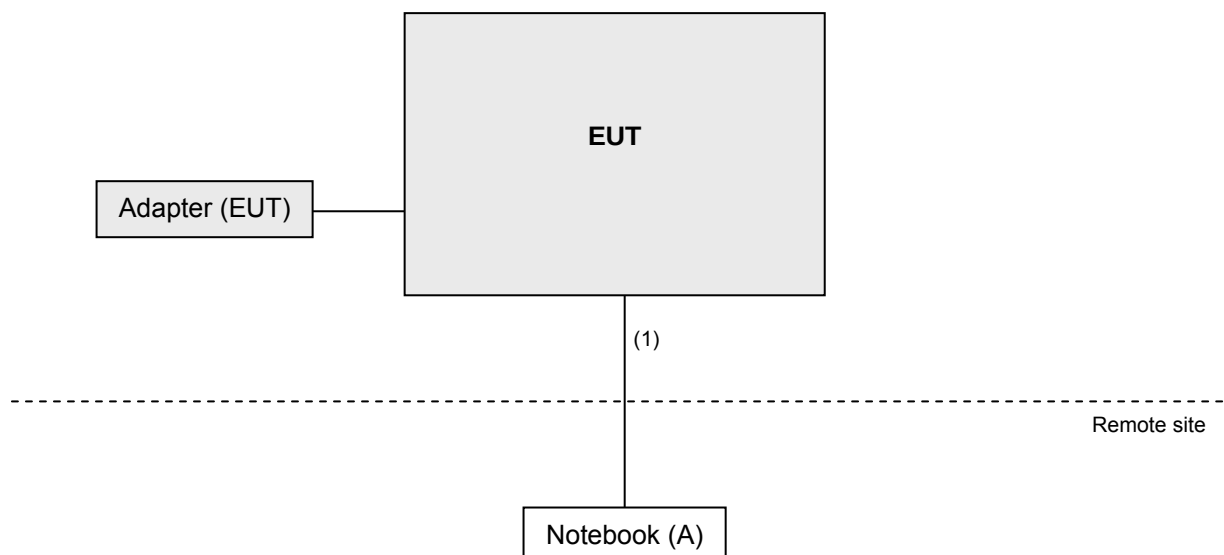
| ID | Product  | Brand | Model No. | Serial No. | FCC ID           | Remarks |
|----|----------|-------|-----------|------------|------------------|---------|
| A. | Notebook | DELL  | E5410     | 6RP2YM1    | FCC DoC Approved | -       |

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item A acted as a communication partner to transfer data.

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks |
|----|--------------|------|------------|--------------------|--------------|---------|
| 1. | RJ45, Cat5e  | 1    | 3          | N                  | 0            | -       |

#### 3.3.1 Configuration of System under Test



### 3.4 General Description of Applied Standards

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

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

**KDB 558074 D01 DTS Meas Guidance v04**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

**ANSI C63.10-2013**

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. Other emissions shall be at least 30dB below the highest level of the desired power:

| 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.            | Cal. Date     | Cal. Due      |
|-----------------------------------------|------------------------------|-----------------------|---------------|---------------|
| Test Receiver<br>ROHDE & SCHWARZ        | ESCI                         | 100424                | Oct. 17, 2017 | Oct. 16, 2018 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ    | FSP40                        | 100040                | Aug. 18, 2017 | Aug. 17, 2018 |
| BILOG Antenna<br>SCHWARZBECK            | VULB9168                     | 9168-155              | Dec. 11, 2017 | Dec. 10, 2018 |
| HORN Antenna<br>SCHWARZBECK             | BBHA 9120D                   | 9120D-1170            | Dec. 13, 2017 | Dec. 12, 2018 |
| HORN Antenna<br>SCHWARZBECK             | BBHA 9170                    | BBHA9170241           | Dec. 01, 2017 | Nov. 30, 2018 |
| Loop Antenna<br>EMCI                    | EM-6879                      | 269                   | Aug. 11, 2017 | Aug. 10, 2018 |
| Preamplifier<br>Agilent<br>(Below 1GHz) | 8447D                        | 2944A10631            | Aug. 08, 2017 | Aug. 07, 2018 |
| Preamplifier<br>Agilent<br>(Above 1GHz) | 8449B                        | 3008A01922            | Sep. 15, 2017 | Sep. 14, 2018 |
| RF signal cable<br>HUBER+SUHNER         | SUCOFLEX 104                 | MY 13380+295012/04    | Aug. 08, 2017 | Aug. 07, 2018 |
| RF signal cable<br>HUBER+SUHNER         | SUCOFLEX 104                 | Cable-CH4-03 (250724) | Aug. 08, 2017 | Aug. 07, 2018 |
| Software<br>BV ADT                      | ADT_Radiated_<br>V7.6.15.9.4 | NA                    | NA            | NA            |
| Antenna Tower<br>inn-co GmbH            | MA 4000                      | 010303                | NA            | NA            |
| Antenna Tower Controller<br>BV ADT      | AT100                        | AT93021703            | NA            | NA            |
| Turn Table<br>BV ADT                    | TT100                        | TT93021703            | NA            | NA            |
| Turn Table Controller<br>BV ADT         | SC100                        | SC93021703            | NA            | NA            |
| Boresight Antenna Fixture               | FBA-01                       | FBA-SIP01             | NA            | NA            |
| High Speed Peak Power<br>Meter          | ML2495A                      | 0824012               | Aug. 18, 2017 | Aug. 17, 2018 |
| Power Sensor                            | MA2411B                      | 0738171               | Aug. 18, 2017 | Aug. 17, 2018 |

- 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 4.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is IC 7450F-4.

#### 4.1.3 Test Procedures

##### For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

##### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 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:

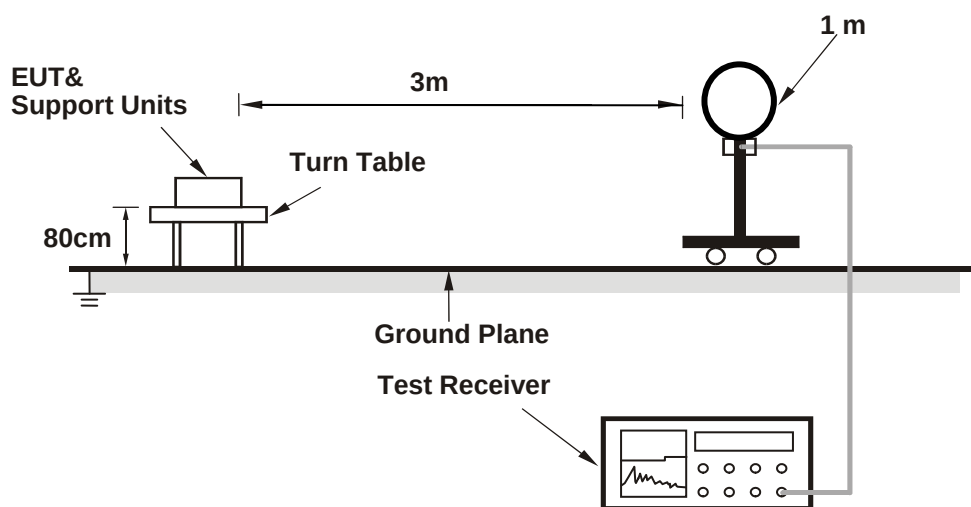
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) 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

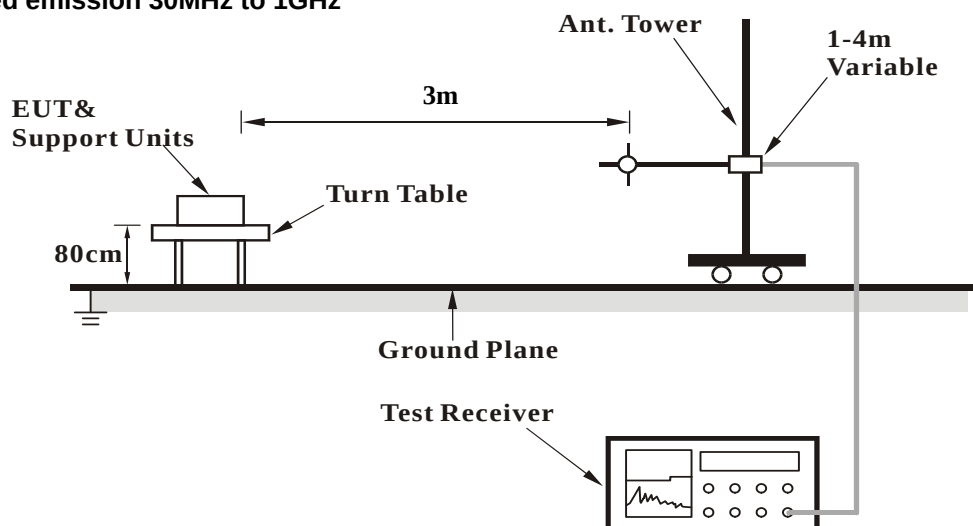
No deviation.

#### 4.1.5 Test Setup

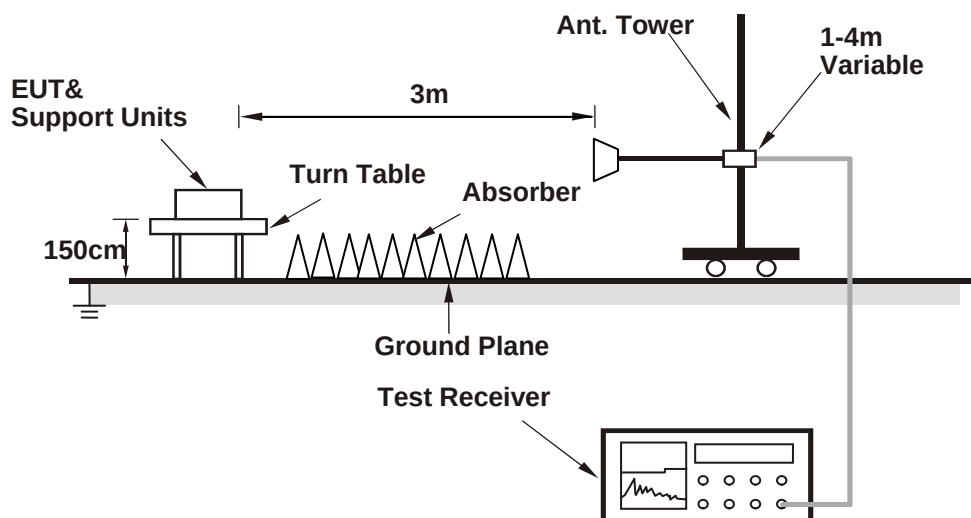
##### For Radiated emission below 30MHz



##### For Radiated emission 30MHz to 1GHz



#### For Radiated emission above 1GHz



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

#### 4.1.6 EUT Operating Conditions

- Placed the EUT on the testing table.
- Prepared a notebook to act as a 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".

#### 4.1.7 Test Results

Above 1GHz Data:

802.11n (HT40)

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

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|-----------------------------------------------------|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.                                                 | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1                                                   | 2390.00        | 56.6 PK                       | 74.0              | -17.4          | 1.60 H                   | 314                        | 23.2                   | 33.4                           |
| 2                                                   | 2390.00        | 45.5 AV                       | 54.0              | -8.5           | 1.60 H                   | 314                        | 12.1                   | 33.4                           |
| 3                                                   | *2437.00       | 95.9 PK                       |                   |                | 1.60 H                   | 314                        | 62.5                   | 33.4                           |
| 4                                                   | *2437.00       | 86.8 AV                       |                   |                | 1.60 H                   | 314                        | 53.4                   | 33.4                           |
| 5                                                   | 2483.50        | 57.5 PK                       | 74.0              | -16.5          | 1.60 H                   | 314                        | 24.0                   | 33.5                           |
| 6                                                   | 2483.50        | 45.7 AV                       | 54.0              | -8.3           | 1.60 H                   | 314                        | 12.2                   | 33.5                           |
| 7                                                   | 4874.00        | 47.6 PK                       | 74.0              | -26.4          | 2.10 H                   | 256                        | 44.3                   | 3.3                            |
| 8                                                   | 4874.00        | 33.9 AV                       | 54.0              | -20.1          | 2.10 H                   | 256                        | 30.6                   | 3.3                            |
| 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        | 65.6 PK                       | 74.0              | -8.4           | 1.95 V                   | 338                        | 32.2                   | 33.4                           |
| 2                                                   | 2390.00        | 52.7 AV                       | 54.0              | -1.3           | 1.95 V                   | 338                        | 19.3                   | 33.4                           |
| 3                                                   | *2437.00       | 113.1 PK                      |                   |                | 1.95 V                   | 338                        | 79.7                   | 33.4                           |
| 4                                                   | *2437.00       | 103.8 AV                      |                   |                | 1.95 V                   | 338                        | 70.4                   | 33.4                           |
| 5                                                   | 2483.50        | 68.8 PK                       | 74.0              | -5.2           | 1.95 V                   | 338                        | 35.3                   | 33.5                           |
| 6                                                   | <b>2483.50</b> | <b>53.8 AV</b>                | <b>54.0</b>       | <b>-0.2</b>    | <b>1.95 V</b>            | <b>338</b>                 | <b>20.3</b>            | <b>33.5</b>                    |
| 7                                                   | 4874.00        | 47.8 PK                       | 74.0              | -26.2          | 2.05 V                   | 332                        | 44.5                   | 3.3                            |
| 8                                                   | 4874.00        | 34.9 AV                       | 54.0              | -19.1          | 2.05 V                   | 332                        | 31.6                   | 3.3                            |

Remarks:

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



Below 1GHz worst-case data: 802.11n (HT40)

|                 |              |                      |                 |
|-----------------|--------------|----------------------|-----------------|
| CHANNEL         | TX Channel 6 | DETECTOR<br>FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | 9kHz ~ 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                                                   | 55.13          | 22.6 QP                       | 40.0              | -17.4          | 1.00 H                   | 318                        | 36.7                   | -14.1                          |
| 2                                                   | 101.69         | 22.5 QP                       | 43.5              | -21.0          | 1.50 H                   | 134                        | 40.6                   | -18.1                          |
| 3                                                   | 268.57         | 24.5 QP                       | 46.0              | -21.5          | 1.00 H                   | 125                        | 37.6                   | -13.1                          |
| 4                                                   | 344.24         | 25.7 QP                       | 46.0              | -20.3          | 1.00 H                   | 52                         | 37.1                   | -11.4                          |
| 5                                                   | 567.39         | 37.0 QP                       | 46.0              | -9.0           | 1.50 H                   | 146                        | 44.0                   | -7.0                           |
| 6                                                   | 912.78         | 39.2 QP                       | 46.0              | -6.8           | 1.50 H                   | 305                        | 39.0                   | 0.2                            |
| 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                                                   | 60.95          | 34.2 QP                       | 40.0              | -5.8           | 1.01 V                   | 149                        | 48.6                   | -14.4                          |
| 2                                                   | 101.69         | 24.8 QP                       | 43.5              | -18.7          | 1.50 V                   | 14                         | 42.9                   | -18.1                          |
| 3                                                   | 437.38         | 24.7 QP                       | 46.0              | -21.3          | 1.50 V                   | 133                        | 34.0                   | -9.3                           |
| 4                                                   | 557.69         | 34.9 QP                       | 46.0              | -11.1          | 1.01 V                   | 103                        | 42.3                   | -7.4                           |
| 5                                                   | 794.42         | 29.4 QP                       | 46.0              | -16.6          | 1.01 V                   | 216                        | 31.1                   | -1.7                           |
| 6                                                   | 939.95         | 37.6 QP                       | 46.0              | -8.4           | 1.01 V                   | 13                         | 36.8                   | 0.8                            |

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      |
|------------------------------------------|--------------------------|----------------|---------------|---------------|
| Test Receiver<br>ROHDE & SCHWARZ         | ESCI                     | 100613         | Nov. 23, 2017 | Nov. 22, 2018 |
| RF signal cable (with 10dB PAD)<br>Woken | 5D-FB                    | Cable-cond1-01 | Sep. 05, 2017 | Sep. 04, 2018 |
| LISN<br>ROHDE & SCHWARZ<br>(EUT)         | ESH3-Z5                  | 835239/001     | Mar. 06, 2018 | Mar. 05, 2019 |
| LISN<br>ROHDE & SCHWARZ<br>(Peripheral)  | ESH3-Z5                  | 100311         | Aug. 15, 2017 | Aug. 14, 2018 |
| Software<br>ADT                          | BV ADT_Conf_<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 1.

3. The VCCI Site Registration No. is C-2040.

#### 4.2.3 Test Procedures

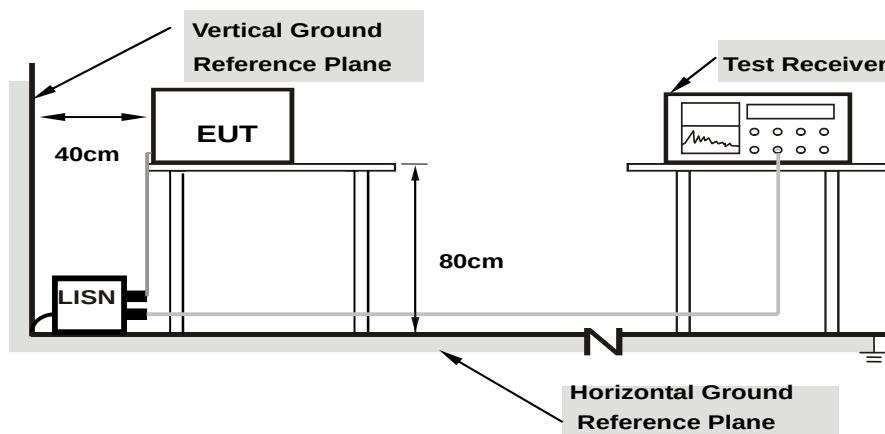
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

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

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



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

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

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

#### 4.2.7 Test Results

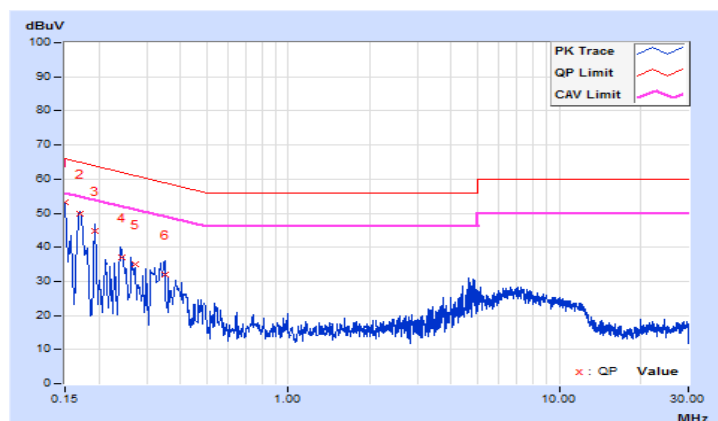
Worst-case data: 802.11n (HT40)

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

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |       | Emission Level |       | Limit     |       | Margin |        |
|----|----------------|-------------------------|---------------|-------|----------------|-------|-----------|-------|--------|--------|
|    |                |                         | [dB (uV)]     |       | [dB (uV)]      |       | [dB (uV)] |       | (dB)   |        |
|    |                |                         | Q.P.          | AV.   | Q.P.           | AV.   | Q.P.      | AV.   | Q.P.   | AV.    |
| 1  | 0.15000        | 10.16                   | 42.88         | 23.53 | 53.04          | 33.69 | 66.00     | 56.00 | -12.96 | -22.31 |
| 2  | 0.16967        | 10.16                   | 39.78         | 24.02 | 49.94          | 34.18 | 64.98     | 54.98 | -15.04 | -20.80 |
| 3  | 0.19255        | 10.16                   | 34.72         | 19.36 | 44.88          | 29.52 | 63.93     | 53.93 | -19.05 | -24.41 |
| 4  | 0.24384        | 10.17                   | 26.87         | 11.41 | 37.04          | 21.58 | 61.96     | 51.96 | -24.92 | -30.38 |
| 5  | 0.27120        | 10.17                   | 24.86         | 10.94 | 35.03          | 21.11 | 61.08     | 51.08 | -26.05 | -29.97 |
| 6  | 0.34926        | 10.19                   | 21.93         | 12.60 | 32.12          | 22.79 | 58.98     | 48.98 | -26.86 | -26.19 |

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.

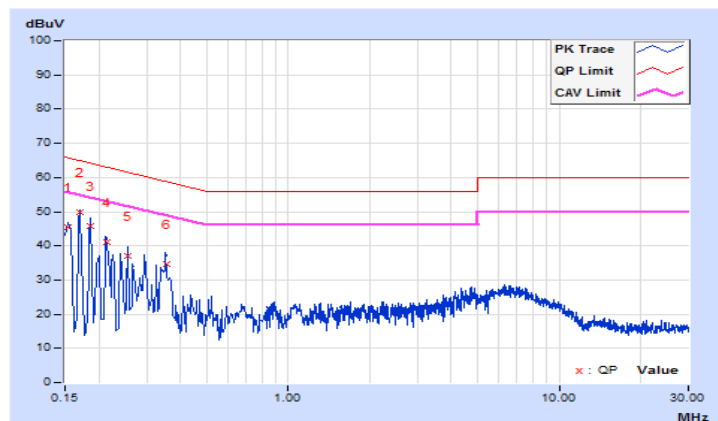


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| No | 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  | 0.15391        | 10.15                   | 35.17                      | 16.83 | 45.32                       | 26.98 | 65.79              | 55.79 | -20.47         | -28.81 |
| 2  | 0.16967        | 10.15                   | 39.60                      | 23.37 | 49.75                       | 33.52 | 64.98              | 54.98 | -15.23         | -21.46 |
| 3  | 0.18508        | 10.16                   | 35.68                      | 18.77 | 45.84                       | 28.93 | 64.25              | 54.25 | -18.41         | -25.32 |
| 4  | 0.21282        | 10.17                   | 30.90                      | 15.02 | 41.07                       | 25.19 | 63.09              | 53.09 | -22.02         | -27.90 |
| 5  | 0.25458        | 10.17                   | 26.72                      | 10.53 | 36.89                       | 20.70 | 61.61              | 51.61 | -24.72         | -30.91 |
| 6  | 0.35389        | 10.19                   | 24.44                      | 12.57 | 34.63                       | 22.76 | 58.87              | 48.87 | -24.24         | -26.11 |

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 FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

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

### Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

### Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

### Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

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

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

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