

## Supplemental “Transmit Simultaneously” Test Report

**Report No.:** RF150107E06B-4

**FCC ID:** PPD-QCNFA344AH

**Test Model:** QCNFA344A

**Received Date:** Jan. 07, 2015

**Test Date:** Feb. 06 to 25, 2015

**Issued Date:** May 13, 2015

**Applicant:** Qualcomm Atheros, Inc.

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

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

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

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

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.



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### Release Control Record

| Issue No.      | Description       | Date Issued  |
|----------------|-------------------|--------------|
| RF150107E06B-4 | Original release. | May 13, 2015 |



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## 1 Certificate of Conformity

**Product:** 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card

**Brand:** Qualcomm Atheros

**Test Model:** QCNFA344A

**Sample Status:** R&D SAMPLE

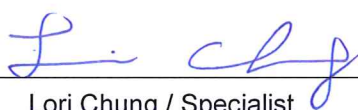
**Applicant:** Qualcomm Atheros, Inc.

**Test Date:** Feb. 06 to 25, 2015

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

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

**Prepared by :**

  
Lori Chung / Specialist

**Date:**

May 13, 2015

**Approved by :**

  
May Chen / Manager

**Date:**

May 13, 2015

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (SECTION 15.247) |  |        |   |
|--|--|--------|---|
| FCC Clause                                     | Test Item                                    | Result | Remarks   |
| 15.207   | AC Power Conducted Emission                  | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -16.82dB at 2.06641MHz. |
| 15.205 /<br>15.209 /<br>15.247(d)              | Radiated Emissions and Band Edge Measurement | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -5.3dB at 240.15MHz.    |

### 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) (±) |
|------------------------------------|----------------|--------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 2.86 dB                        |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 1GHz   | 5.43 dB                        |
| Radiated Emissions above 1 GHz     | 1GHz ~ 6GHz    | 3.72 dB                        |
|                                    | 6GHz ~ 18GHz   | 4.00 dB                        |
|                                    | 18GHz ~ 40GHz  | 4.11 dB                        |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                       |   |
|-----------------------|---|
| Product               | 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card  |
| Brand                 | Qualcomm Atheros  |
| Test Model            | QCNFA344A   |
| Status of EUT         | R&D SAMPLE  |
| Power Supply Rating   | 3.3Vdc form host equipment  |
| Modulation Type       | <b>WLAN:</b><br>CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM<br>256QAM for OFDM in 11ac mode and VHT (20/40) mode in 2.4GHz<br><b>Bluetooth (EDR):</b><br>GFSK, $\pi/4$ -DQPSK, 8DPSK<br><b>Bluetooth (LE):</b><br>GFSK  |
| Modulation Technology | <b>WLAN:</b> DSSS, OFDM<br><b>Bluetooth (EDR):</b> FHSS<br><b>Bluetooth (LE):</b> DTS   |
| Transfer Rate         | <b>WLAN:</b><br>802.11b: up to 11Mbps<br>802.11a/g: up to 54Mbps<br>802.11n : up to 300Mbps<br>802.11ac: up to 866.7Mbps<br><b>Bluetooth (EDR):</b><br>up to 3Mbps<br><b>Bluetooth (LE):</b><br>up to 1Mbps   |
| Operating Frequency   | <b>WLAN:</b><br>For 15.407<br>5.18 ~ 5.24GHz, 5.26 ~ 5.32GHz, 5.50 ~ 5.72GHz<br>For 15.247<br>2.412 ~ 2.472GHz, 5.745 ~ 5.825GHz<br><b>Bluetooth:</b><br>2402MHz ~ 2480MHz  |
| Number of Channel     | <b>WLAN:</b><br>For 15.407<br>20 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)<br>10 for 802.11n (HT40), 802.11ac (VHT40)<br>5 for 802.11ac (VHT80)<br>For 15.247(2.4GHz)<br>13 for 802.11b/g, 802.11n (HT20), VHT20<br>9 for 802.11n (HT40), VHT40<br>5GHz(5GHz)<br>5 for 802.11a, 802.11n (HT20), 802.11ac (VHT20)<br>2 for 802.11n (HT40), 802.11ac (VHT40)<br>1 for 802.11ac (VHT80)<br><b>Bluetooth (EDR):</b> 79<br><b>Bluetooth (LE):</b> 40 |

|                     |   |
|---------------------|---|
| Output Power        | <b>WLAN:</b><br>For 15.407<br>802.11a: 72.312mW<br>802.11ac (VHT20): 73.119mW<br>802.11ac (VHT40): 60.324mW<br>802.11ac (VHT80): 47.178mW<br>For 15.247 (2.4GHz)<br>802.11b: 302.764mW<br>802.11g: 524.318mW<br>VHT20: 503.893mW<br>VHT40: 483.605mW<br>For 15.247 (5GHz)<br>802.11a: 255.559mW<br>802.11ac (VHT20): 251.496mW<br>802.11ac (VHT40): 229.75mW<br>802.11ac (VHT80): 326.384Mw<br><b>Bluetooth (EDR): 19.634mW</b><br><b>Bluetooth (LE): 2.773mW</b> |
| Antenna Type        | See item 3.2  |
| Antenna Connector   | See item 3.2  |
| Accessory Device    | NA  |
| Data Cable Supplied | NA  |

Note:

1. There are Bluetooth technology and WLAN technology used for the EUT.
2. The EUT incorporates a 2T2R function.

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

### 3. WLAN/BT coexistence mode:

#### ◆ 2x2 WLAN + BT:

■ 5GHz 802.11a/an (or 11ac) transmit concurrent with BT.

■ 2.4GHz: timely shared coexistence.

### 4. The emission (conducted & radiated emission) of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

| Mode                  | Available Channel | Tested Channel | Modulation Technology |
|-----------------------|-------------------|----------------|-----------------------|
| 5 GHz<br>(802.11a)    | 149 to 165        | 157            | OFDM                  |
| +<br>Bluetooth (GFSK) | 0 to 78           | 39             | FHSS                  |

### 5. 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 Antenna

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

| Transmitter Circuit | Brand | Model        | Ant. Type | 2.4GHz Gain with cable loss (dBi) | 5GHz Gain with cable loss (dBi) | 2.4GHz Cable Loss (dBi) | 5G Cable Loss (dBi) | Connector Type | Cable Length (mm) |
|---------------------|-------|--------------|-----------|-----------------------------------|---------------------------------|-------------------------|---------------------|----------------|-------------------|
| Chain (0)           | WNC   | 81-EBJ15.005 | PIFA      | 3.00                              | Band 1&2: 2.56                  | 1.15                    | Band 1&2: 1.70      | IPEX           | 300               |
|                     |       |              |           |                                   | Band 3: 4.76                    |                         | Band 3: 1.74        |                |                   |
|                     |       |              |           |                                   | Band 4: 4.76                    |                         | Band 4: 1.79        |                |                   |
| Chain (1)           | WNC   | 81-EBJ15.005 | PIFA      | 3.62                              | Band 1&2: 3.08                  | 1.15                    | Band 1&2: 1.70      | IPEX           | 300               |
|                     |       |              |           |                                   | Band 3: 3.31                    |                         | Band 3: 1.74        |                |                   |
|                     |       |              |           |                                   | Band 4: 2.42                    |                         | Band 4: 1.79        |                |                   |

Note: 1. Above antenna gains of antenna are Total (H+V).

### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT CONFIGURE MODE | APPLICABLE TO |       |     |    | DESCRIPTION |
|--------------------|---------------|-------|-----|----|-------------|
|                    | RE $\geq$ 1G  | RE<1G | PLC | OB |             |
| -                  | √             | √     | √   | √  | -           |

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz & Bandedge Measurement  
**RE<1G**: Radiated Emission below 1GHz  
**PLC**: Power Line Conducted Emission  
**OB**: Conducted Out-Band Emission Measurement

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

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE               | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|--------------------|-------------------|----------------|-----------------------|------------------|
| 5 GHz (802.11a)    | 149 to 165        | 157            | OFDM                  | 6                |
| + Bluetooth (GFSK) | 0 to 78           | 39             | FHSS                  | 3                |

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

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE               | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|--------------------|-------------------|----------------|-----------------------|------------------|
| 5 GHz (802.11a)    | 149 to 165        | 157            | OFDM                  | 6                |
| + Bluetooth (GFSK) | 0 to 78           | 39             | FHSS                  | 3                |

#### Power Line Conducted Emission Test:

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE               | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|--------------------|-------------------|----------------|-----------------------|------------------|
| 5 GHz (802.11a)    | 149 to 165        | 157            | OFDM                  | 6                |
| + Bluetooth (GFSK) | 0 to 78           | 39             | FHSS                  | 3                |

#### Conducted Out-Band Emission Measurement:

☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE               | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | DATA RATE (Mbps) |
|--------------------|-------------------|----------------|-----------------------|------------------|
| 5 GHz (802.11a)    | 149 to 165        | 157            | OFDM                  | 6                |
| + Bluetooth (GFSK) | 0 to 78           | 39             | FHSS                  | 3                |

#### Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY     |
|---------------|--------------------------|----------------------|---------------|
| RE $\geq$ 1G  | 22deg. C, 69%RH          | 120Vac, 60Hz         | Gary Cheng    |
| RE<1G         | 21deg. C, 70%RH          | 120Vac, 60Hz         | Gary Cheng    |
| PLC           | 20deg. C, 60%RH          | 120Vac, 60Hz         | Barry Lee     |
| OB            | 15deg. C, 57%RH          | 120Vac, 60Hz         | Anderson Chen |

### 3.3 Duty Cycle of Test Signal

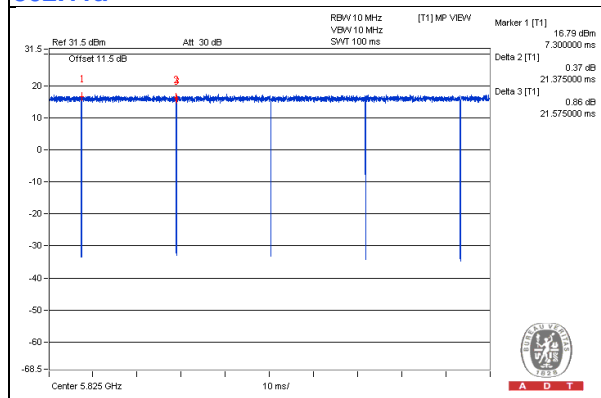
If duty cycle of test signal is  $\geq 98\%$ , duty factor is not required.

### 3.4 Duty Cycle of Test Signal

Duty cycle of test signal is  $\geq 98\%$ , duty factor is not required.

**5GHz Band\_802.11a:** Duty cycle = 21.375 ms/21.575 ms = 0.991

#### 802.11a



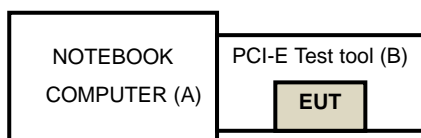
### 3.5 Description of Support Units

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

| No. | Product           | Brand            | Model No. | Serial No. | FCC ID  | Remark             |
|-----|-------------------|------------------|-----------|------------|---------|--------------------|
| A   | NOTEBOOK COMPUTER | DELL             | E5430     | HYV4VY1    | FCC DoC | Provided by Lab    |
| B   | PCI-E Test tool   | Qualcomm Atheros | NA        | NA         | NA      | Supplied by Client |

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

#### 3.5.1 Configuration of System under Test



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

#### NOTE:

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

#### 4.1.2 Test Instruments

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                      | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|---------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY50010156                      | Aug. 11, 2014   | Aug. 10, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-04                      | Nov. 12, 2014   | Nov. 11, 2015    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-361                        | Feb. 27, 2014   | Feb. 26, 2015    |
| RF Cable                                | NA                       | CHHCAB_001                      | Oct. 05, 2014   | Oct. 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000220091110                   | Aug. 26, 2014   | Aug. 25, 2015    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 300801923                       | Oct. 28, 2014   | Oct. 27, 2015    |
| RF Cable                                | NA                       | 131206<br>131215<br>SNMY23685/4 | Jan. 16, 2015   | Jan. 15, 2016    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                          | July 05, 2014   | July 04, 2015    |
| Pre-Amplifier<br>EMCI                   | EMC184045                | 980143                          | Jan. 16, 2015   | Jan. 15, 2016    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                        | Aug. 26, 2014   | Aug. 25, 2015    |
| RF Cable                                | NA                       | RF104-121<br>RF104-204          | Dec. 11, 2014   | Dec. 10, 2015    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                              | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                              | NA              | NA               |
| SPECTRUM ANALYZER<br>R&S                | FSP 40                   | 100060                          | May 08, 2014    | May 07, 2015     |

#### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
- 5 The CANADA Site Registration No. is IC 7450H-3.
- 6 Tested Date: Feb. 16 to 25, 2015

#### 4.1.3 Test Procedures

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

#### NOTE:

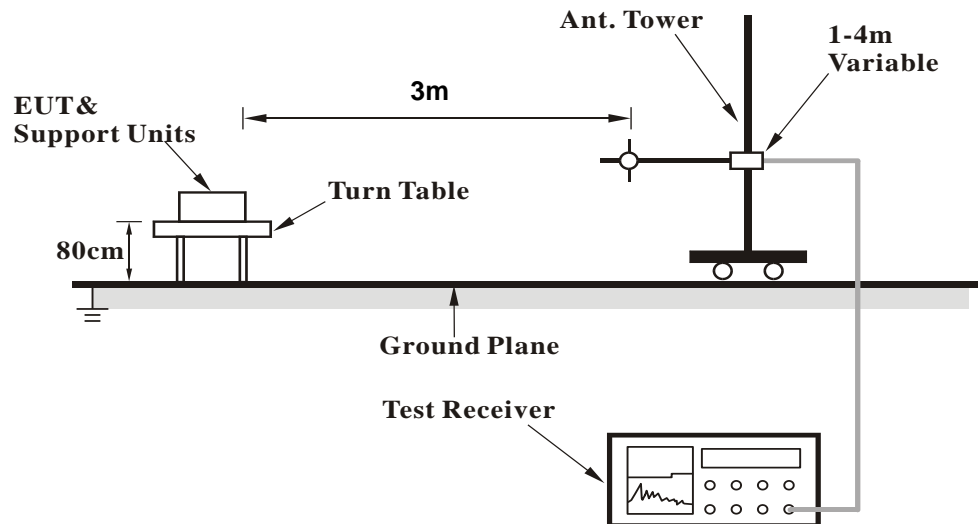
1. For emission measurements above 1 GHz, the EUT shall be placed at a height of 1.5 m above the ground at 3 meter chamber room for test
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
3. The resolution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

#### 4.1.4 Deviation from Test Standard

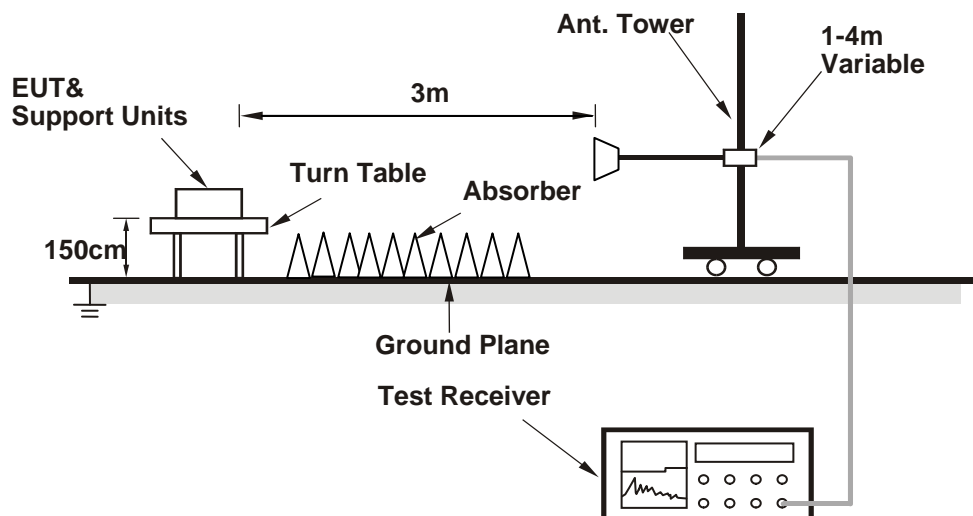
C63.10:2009 requires a 0.8m EUT height above 1GHz, but in accordance with the FCC December 2014 TCB Conference call, a 1.5m EUT height is allowed.

#### 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 Conditions

1. Connect the EUT with the support unit A (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program "QCAR T Version: 3.0.33.0" to enable EUT under transmission/receiving condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### Above 1GHz Data

|                        |              |                          |                           |
|------------------------|--------------|--------------------------|---------------------------|
| <b>FREQUENCY RANGE</b> | 1GHz ~ 40GHz | <b>DETECTOR FUNCTION</b> | Peak (PK)<br>Average (AV) |
|------------------------|--------------|--------------------------|---------------------------|

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 4882.00     | 51.8 PK                 | 74.0           | -22.2       | 1.08 H             | 99                   | 44.59            | 7.21                     |
| 2   | 4882.00     | 37.9 AV                 | 54.0           | -16.1       | 1.08 H             | 99                   | 30.69            | 7.21                     |
| 3   | 7323.00     | 59.3 PK                 | 74.0           | -14.7       | 1.02 H             | 177                  | 47.55            | 11.75                    |
| 4   | 7323.00     | 46.7 AV                 | 54.0           | -7.3        | 1.02 H             | 177                  | 34.95            | 11.75                    |
| 5   | 11570.00    | 54.8 PK                 | 74.0           | -19.2       | 1.00 H             | 203                  | 40.37            | 14.43                    |
| 6   | 11570.00    | 40.9 AV                 | 54.0           | -13.1       | 1.00 H             | 203                  | 26.47            | 14.43                    |
| 7   | #17355.00   | 61.3 PK                 | 74.0           | -12.7       | 1.52 H             | 139                  | 37.36            | 23.94                    |
| 8   | #17355.00   | 48.4 AV                 | 54.0           | -5.6        | 1.52 H             | 139                  | 24.46            | 23.94                    |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |             |                         |                |             |                    |                      |                  |                          |
| NO.   | FREQ. (MHz) | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 4882.00     | 51.2 PK                 | 74.0           | -22.8       | 1.02 V             | 200                  | 43.99            | 7.21                     |
| 2   | 4882.00     | 39.6 AV                 | 54.0           | -14.4       | 1.02 V             | 200                  | 32.39            | 7.21                     |
| 3   | 7323.00     | 58.9 PK                 | 74.0           | -15.1       | 1.20 V             | 268                  | 47.15            | 11.75                    |
| 4   | 7323.00     | 47.7 AV                 | 54.0           | -6.3        | 1.20 V             | 268                  | 35.95            | 11.75                    |
| 5   | 11570.00    | 54.1 PK                 | 74.0           | -19.9       | 1.01 V             | 184                  | 39.67            | 14.43                    |
| 6   | 11570.00    | 41.0 AV                 | 54.0           | -13.0       | 1.01 V             | 184                  | 26.57            | 14.43                    |
| 7   | #17355.00   | 59.7 PK                 | 74.0           | -14.3       | 1.24 V             | 135                  | 35.76            | 23.94                    |
| 8   | #17355.00   | 47.2 AV                 | 54.0           | -6.8        | 1.24 V             | 135                  | 23.26            | 23.94                    |

#### REMARKS:

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



# Below 1GHz Data

|                        |            |                          |                 |
|------------------------|------------|--------------------------|-----------------|
| <b>FREQUENCY RANGE</b> | Below 1GHz | <b>DETECTOR FUNCTION</b> | Quasi-Peak (QP) |
|------------------------|------------|--------------------------|-----------------|

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |               |                         |                |             |                    |                      |                  |                          |
|---|---------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| NO.   | FREQ. (MHz)   | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 166.22        | 36.4 QP                 | 43.5           | -7.1        | 1.10 H             | 130                  | 49.62            | -13.24                   |
| 2   | <b>240.15</b> | <b>40.7 QP</b>          | <b>46.0</b>    | <b>-5.3</b> | <b>1.10 H</b>      | <b>100</b>           | <b>54.78</b>     | <b>-14.06</b>            |
| 3   | 252.90        | 35.5 QP                 | 46.0           | -10.5       | 1.00 H             | 102                  | 49.35            | -13.83                   |
| 4   | 257.20        | 34.0 QP                 | 46.0           | -12.0       | 1.00 H             | 152                  | 47.71            | -13.71                   |
| 5   | 335.90        | 36.4 QP                 | 46.0           | -9.6        | 1.00 H             | 100                  | 47.24            | -10.80                   |
| 6   | 608.70        | 36.2 QP                 | 46.0           | -9.9        | 1.20 H             | 133                  | 40.72            | -4.57                    |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |               |                         |                |             |                    |                      |                  |                          |
| NO.   | FREQ. (MHz)   | EMISSION LEVEL (dBuV/m) | LIMIT (dBuV/m) | MARGIN (dB) | ANTENNA HEIGHT (m) | TABLE ANGLE (Degree) | RAW VALUE (dBuV) | CORRECTION FACTOR (dB/m) |
| 1   | 134.78        | 22.4 QP                 | 43.5           | -21.1       | 1.00 V             | 100                  | 36.15            | -13.73                   |
| 2   | 166.35        | 32.2 QP                 | 43.5           | -11.3       | 1.00 V             | 110                  | 45.44            | -13.25                   |
| 3   | 240.10        | 30.6 QP                 | 46.0           | -15.4       | 1.00 V             | 58                   | 44.64            | -14.07                   |
| 4   | 335.38        | 31.2 QP                 | 46.0           | -14.8       | 1.00 V             | 42                   | 42.02            | -10.80                   |
| 5   | 608.58        | 28.7 QP                 | 46.0           | -17.4       | 1.00 V             | 152                  | 33.22            | -4.57                    |
| 6   | 611.14        | 27.6 QP                 | 46.0           | -18.5       | 1.00 V             | 100                  | 32.06            | -4.51                    |

## 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. | CALIBRATED DATE | CALIBRATED UNTIL |
|--|-----------------------------|------------|-----------------|------------------|
| Test Receiver<br>ROHDE & SCHWARZ   | ESCS 30                     | 100375     | Apr. 29, 2014   | Apr. 28, 2015    |
| Line-Impedance<br>Stabilization Network<br>(for EUT)<br>SCHWARZBECK            | NSLK-8127                   | 8127-522   | Sep. 15, 2014   | Sep. 14, 2015    |
| Line-Impedance<br>Stabilization Network<br>(for Peripheral)<br>ROHDE & SCHWARZ | ENV216                      | 100071     | Nov. 10, 2014   | Nov. 09, 2015    |
| RF Cable<br>(JYEBAO)   | 5DFB                        | COCCAB-001 | Mar. 10, 2014   | Mar. 09, 2015    |
| 50 ohms Terminator   | N/A                         | EMC-03     | Sep. 22, 2014   | Sep. 21, 2015    |
| 50 ohms Terminator   | N/A                         | EMC-02     | Sep. 30, 2014   | Sep. 29, 2015    |
| Software<br>ADT  | BV<br>ADT_Cond_V7.3.7.<br>3 | NA         | NA              | NA               |

#### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Feb. 17, 2015

### 4.2.3 Test Procedures

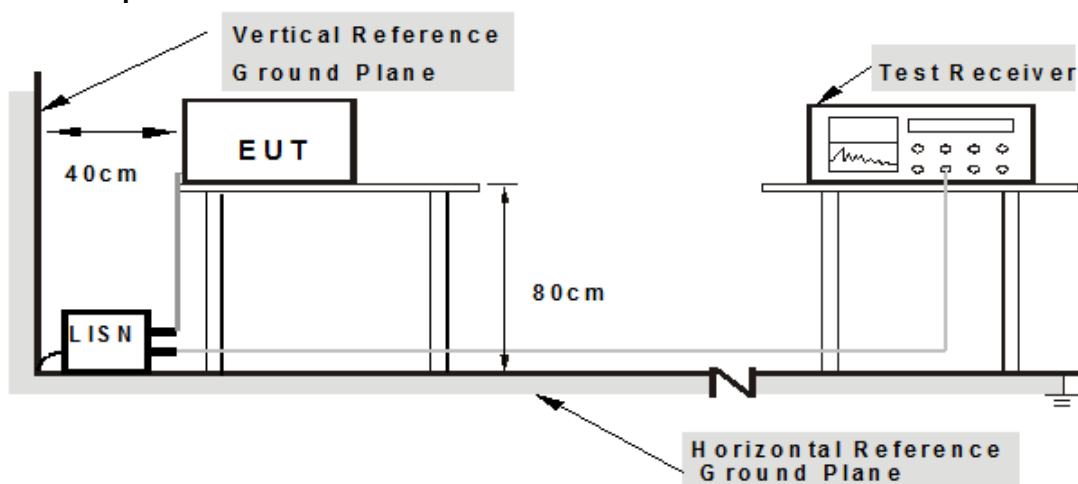
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

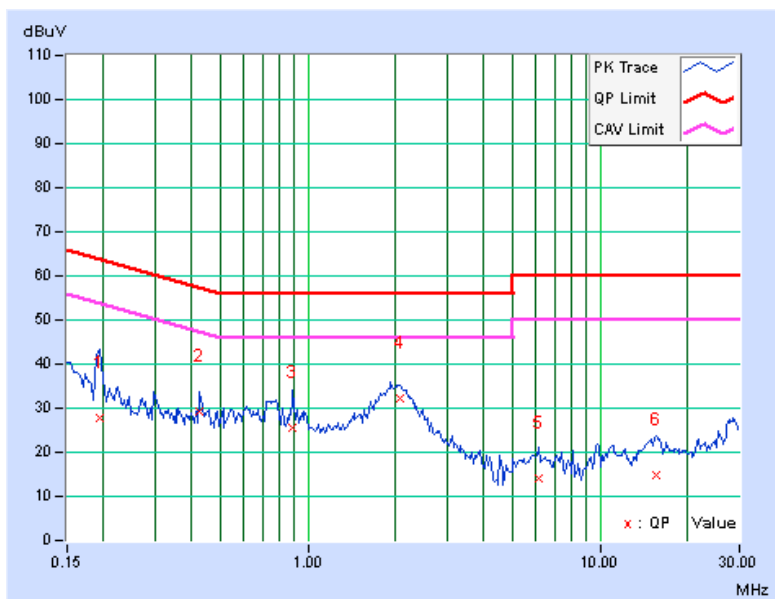
## 4.2.7 Test Results

| Phase | Line (L) | 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        | 0.19297        | 0.07                    | 27.58                      | 22.76        | 27.65                       | 22.83        | 63.91              | 53.91        | -36.26         | -31.08        |
| 2        | 0.42734        | 0.09                    | 29.34                      | 26.53        | 29.43                       | 26.62        | 57.30              | 47.30        | -27.87         | -20.68        |
| 3        | 0.88828        | 0.12                    | 25.42                      | 21.81        | 25.54                       | 21.93        | 56.00              | 46.00        | -30.46         | -24.07        |
| <b>4</b> | <b>2.06641</b> | <b>0.18</b>             | <b>32.01</b>               | <b>29.00</b> | <b>32.19</b>                | <b>29.18</b> | <b>56.00</b>       | <b>46.00</b> | <b>-23.81</b>  | <b>-16.82</b> |
| 5        | 6.12891        | 0.32                    | 13.81                      | 9.57         | 14.13                       | 9.89         | 60.00              | 50.00        | -45.87         | -40.11        |
| 6        | 15.54688       | 0.60                    | 14.34                      | 10.00        | 14.94                       | 10.60        | 60.00              | 50.00        | -45.06         | -39.40        |

### 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

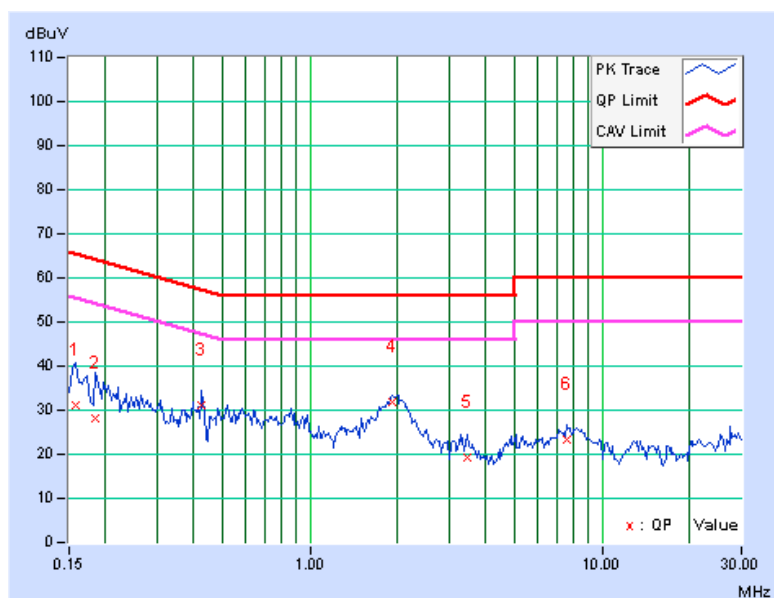


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| No | Freq.   | Corr. Factor | Reading Value |       | Emission Level |       | Limit     |       | Margin |        |
|----|---------|--------------|---------------|-------|----------------|-------|-----------|-------|--------|--------|
|    | [MHz]   |              | [dB (uV)]     |       | [dB (uV)]      |       | [dB (uV)] |       | (dB)   |        |
|    |         | (dB)         | Q.P.          | AV.   | Q.P.           | AV.   | Q.P.      | AV.   | Q.P.   | AV.    |
| 1  | 0.15781 | 0.06         | 31.15         | 23.71 | 31.21          | 23.77 | 65.58     | 55.58 | -34.36 | -31.80 |
| 2  | 0.18516 | 0.06         | 27.94         | 22.02 | 28.00          | 22.08 | 64.25     | 54.25 | -36.25 | -32.17 |
| 3  | 0.42734 | 0.09         | 30.97         | 27.70 | 31.06          | 27.79 | 57.30     | 47.30 | -26.24 | -19.51 |
| 4  | 1.92188 | 0.18         | 31.75         | 28.79 | 31.93          | 28.97 | 56.00     | 46.00 | -24.07 | -17.03 |
| 5  | 3.45313 | 0.24         | 19.03         | 13.01 | 19.27          | 13.25 | 56.00     | 46.00 | -36.73 | -32.75 |
| 6  | 7.56250 | 0.38         | 22.81         | 18.28 | 23.19          | 18.66 | 60.00     | 50.00 | -36.81 | -31.34 |

# 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

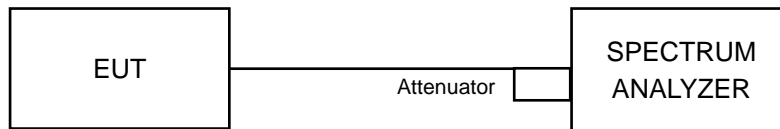


### 4.3 Conducted Out of Band Emission Measurement

#### 4.3.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedures

##### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

##### MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

#### 4.3.5 Deviation from Test Standard

No deviation.

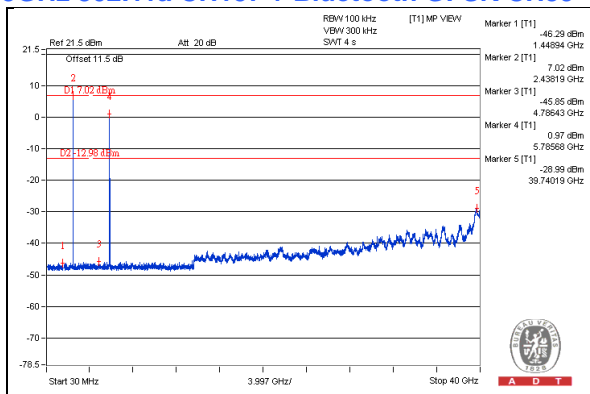
#### 4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

#### 4.3.7 Test Results

The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

## 5GHz 802.11a CH157 + Bluetooth GFSK CH39



## 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:

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-5935343

Fax: 886-3-5935342

**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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