



# FCC TEST REPORT (RFID)

**REPORT NO.:** RF131218D10-4  
**MODEL NO.:** TL10IE1, TL10IE2, TL10Ixy  
**FCC ID:** WL6-TLBC1IE1  
**RECEIVED:** Dec. 19, 2013  
**TESTED:** Jan. 10 ~ 20, 2014  
**ISSUED:** Jan. 27, 2014

**APPLICANT:** Elitegroup Computer Systems Co., Ltd

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**ISSUED BY:** Bureau Veritas Consumer Products Services  
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## RELEASE CONTROL RECORD

| ISSUE NO.     | REASON FOR CHANGE | DATE ISSUED   |
|---------------|-------------------|---------------|
| RF131218D10-4 | Original release  | Jan. 27, 2014 |



## 1. CERTIFICATION

**PRODUCT:** Wireless Motherboard  
**BRAND NAME:** ECS ELITEGROUP  
**MODEL NO.:** TL10IE1, TL10IE2, TL10Ixy  
(x=0~9, A~Z or blank or "-"; y=0~9, A~Z or blank or "-")  
**APPLICANT:** Elitegroup Computer Systems Co., Ltd  
**TESTED:** Jan. 10 ~ 20, 2014  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS:** **FCC Part 15, Subpart C (Section 15.225)**  
ANSI C63.10-2009

The above equipment (Model: TL10IE2) 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** : Annie Chang , **DATE:** Jan. 27, 2014  
( Annie Chang / Supervisor )

**APPROVED BY** : Rex Lai , **DATE:** Jan. 27, 2014  
( Rex Lai / Assistant Manager )

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.225, 15.215) |   |        |  |
|---|---|--------|--|
| STANDARD SECTION  | TEST TYPE AND LIMIT   | RESULT | REMARK   |
| 15.207  | Conducted emission test   | PASS   | Meet the requirement of limit. Minimum passing margin is -23.58dB at 0.16562MHz. |
| 15.225 (a)  | The field strength of any emissions within the band 13.553-13.567 MHz               | PASS   | Meet the requirement of limit. Minimum passing margin is -73.4dB at 13.56MHz.    |
| 15.225 (d)  | The field strength of any emissions appearing outside of the 13.110-14.010 MHz band | PASS   | Meet the requirement of limit. Minimum passing margin is -10.8dB at 41.16MHz.    |
| 15.225 (e)  | The frequency tolerance   | PASS   | Meet the requirement of limit.   |

### 2.1 MEASUREMENT UNCERTAINTY

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

| MEASUREMENT        | FREQUENCY       | UNCERTAINTY |
|--------------------|-----------------|-------------|
| Conducted Emission | 150kHz ~ 30MHz  | 2.41 dB     |
| Radiated emissions | 30MHz ~ 200MHz  | 4.30 dB     |
|                    | 200MHz ~1000MHz | 3.36 dB     |

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

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                            |   |
|----------------------------|---|
| <b>EUT</b>                 | Wireless Motherboard                                  |
| <b>MODEL NO.</b>           | TL10IE1, TL10IE2, TL10Ixy                             |
| <b>POWER SUPPLY</b>        | 12Vdc from AC adapter,<br>3.7V or 3.8Vdc from Battery |
| <b>MODULATION TYPE</b>     | ASK   |
| <b>OPERATING FREQUENCY</b> | 13.56MHz  |
| <b>ANTENNA TYPE</b>        | FPC Antenna   |
| <b>DATA CABLE</b>          | N/A   |
| <b>I/O PORTS</b>           | Refer to user's manual                                |
| <b>ACCESSORY DEVICES</b>   | Refer to Note as below                                |

**NOTE:**

- The EUT is a Wireless Motherboard with a NFC module.
- The "x & y" in the model could be defined as 0~9, A~Z or blank for marketing differentiation. During the test, model: **TL10IE2** was selected as the representative one and therefore only its test data was recorded in this report.
- The EUT consumes power from an AC adapter or battery, as follows:

| Item      | Brand | Model No.  | Spec.   |
|-----------|-------|------------|---|
| Adapter 1 | APD   | WA-24R12FU | AC I/P: 100-240Vac, 50-60Hz, 0.8A Max.<br>DC O/P: 12V, 2A<br>AC 2 Pin. Non-shielded DC cable (1.5m) |
| Adapter 2 | APD   | WA-24K12FU | AC I/P: 100-240Vac, 50-60Hz, 0.8A Max<br>DC O/P: 12V, 2A<br>AC 2 Pin. Non-shielded DC cable (1.5m)  |
| Battery 1 | SWD   | LI8400     | 31W, 3.8V, 8400mAh, 2 CELLS (1S2P)  |
| Battery 2 | GLW   | LI8400     | 31W, 3.8V, 8400mAh, 2 CELLS (1S2P)  |
| Battery 3 | GLW   | LI7700     | 28W, 3.7V, 7700mAh, 2 CELLS (1S2P)  |
| Battery 4 | SWD   | LI7600     | 28W, 3.7V, 7700mAh, 2 CELLS (1S2P)  |

After pre-tested, the worst emission level was found when the EUT was tested under **Adapter 1 with Battery 1** mode, therefore, only its test data was recorded in this report.

- For Spurious Emissions test, following modes were pre-tested:

- ◆ EUT + Adapter
- ◆ EUT only

The worst emission level was found when the EUT was tested under **EUT + Adapter** mode, therefore, only its test data was recorded in this report.

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

## 3.2 DESCRIPTION OF TEST MODES

### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

| EUT CONFIGURE MODE | APPLICABLE TO |     |    | DESCRIPTION |
|--------------------|---------------|-----|----|-------------|
|                    | RE            | PLC | FS |             |
| -                  | √             | √   | √  | -           |

Where **RE**: Radiated Emission      **PLC**: Power Line Conducted Emission  
**FS**: Frequency Stability

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

#### RADIATED EMISSION TEST:

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | ASK             |

#### POWER LINE CONDUCTED EMISSION TEST:

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | ASK             |

#### FREQUENCY STABILITY:

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

| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|-------------------|----------------|-----------------|
| 1                 | 1              | ASK             |

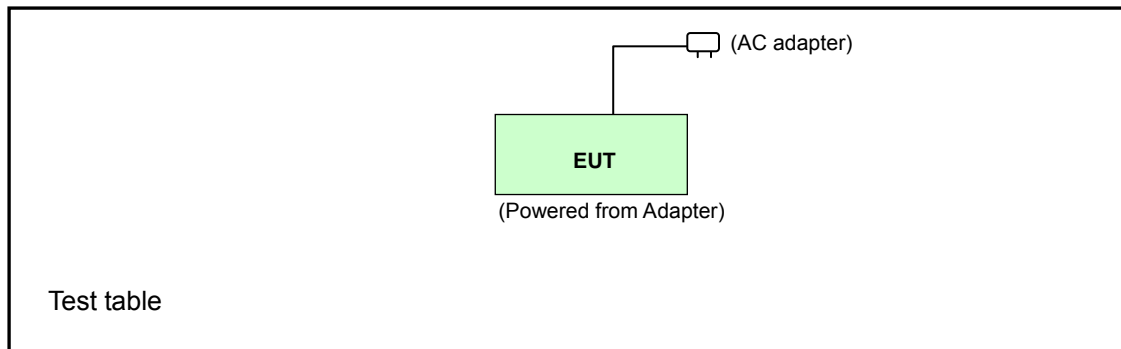
#### TEST CONDITION:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER  | TESTED BY |
|---------------|--------------------------|--------------|-----------|
| RE            | 23deg. C, 71% RH         | 120Vac, 60Hz | Joey Liu  |
| PLC           | 23deg. C, 75% RH         | 120Vac, 60Hz | Joey Liu  |
| FS            | 24deg. C, 70%RH          | 120Vac, 60Hz | Dalen Dai |

### 3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together without other necessary accessories or support units.

#### 3.3.1 CONFIGURATION OF SYSTEM UNDER TEST





### **3.4 GENERAL DESCRIPTION OF APPLIED STANDARDS**

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

**FCC Part 15, Subpart C (15.225)**

**ANSI C63.10-2009**

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

## 4. TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

| 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. As shown in 15.35(b), 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 |
|--|------------------------------|------------|-----------------|------------------|
| HP Preamplifier                              | 8447D                        | 2432A03504 | Feb. 26, 2013   | Feb. 25, 2014    |
| HP Preamplifier                              | 8449B                        | 3008A01201 | Feb. 26, 2013   | Feb. 25, 2014    |
| Agilent<br>TEST RECEIVER                     | N9038A                       | MY51210129 | Jan. 18, 2014   | Jan. 17, 2015    |
| Schwarzbeck Antenna                          | VULB 9168                    | 137        | Mar. 20, 2013   | Mar. 19, 2014    |
| Schwarzbeck Antenna                          | VHBA 9123                    | 480        | May 29, 2013    | May 28, 2014     |
| ADT. Turn Table                              | TT100                        | 0306       | NA              | NA               |
| ADT. Tower                                   | AT100                        | 0306       | NA              | NA               |
| Software                                     | ADT_Radiated_V<br>7.6.15.9.2 | NA         | NA              | NA               |
| SUHNER RF cable                              | SF102                        | CABLE-CH6  | Aug. 16, 2013   | Aug. 15, 2014    |
| Loop Antenna R & S                           | HFH2-Z2                      | 100070     | Jan. 31, 2012   | Jan. 30, 2014    |
| Schwarzbeck Horn<br>Antenna                  | BBHA 9120-D1                 | D130       | May 13, 2013    | May 12, 2014     |
| Highpass filter<br>Wainwright<br>Instruments | WHK<br>3.1/18G-10SS          | SN 8       | NA              | NA               |
| ROHDE & SCHWARZ<br>Spectrum Analyzer         | FSP 40                       | 100036     | May. 17, 2013   | May. 16, 2014    |
| Anritsu<br>Power Sensor                      | MA2411B                      | 0738404    | Apr. 24, 2013   | Apr. 23, 2014    |
| Anritsu<br>Power Meter                       | ML2495A                      | 0842014    | Apr. 25, 2013   | Apr. 24, 2014    |

- 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.

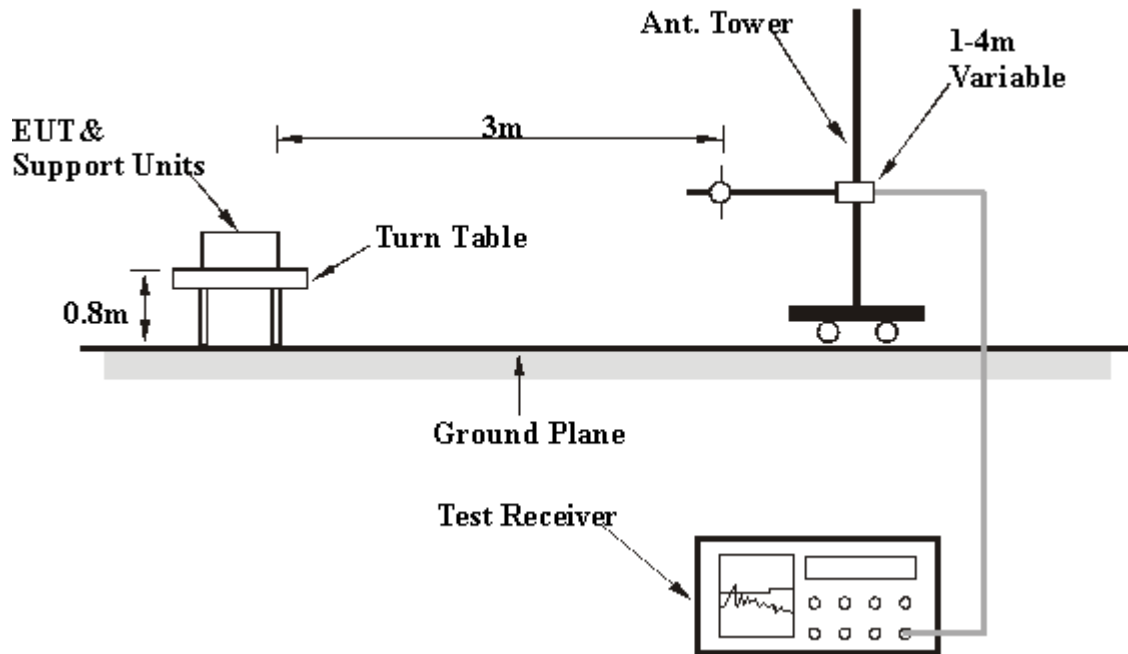
#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

The EUT ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

### 4.1.7 TEST RESULTS

|                        |              |                          |            |
|------------------------|--------------|--------------------------|------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR FUNCTION</b> | Quasi-Peak |
| <b>FREQUENCY RANGE</b> | 13.56MHz     |                          |            |

| ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m |             |                         |                |             |                    |                      |                  |                          |
|---|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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   | 13.56       | 50.6 QP                 | 124.0          | -73.4       | 1.0                | 241                  | 28.88            | 21.74                    |

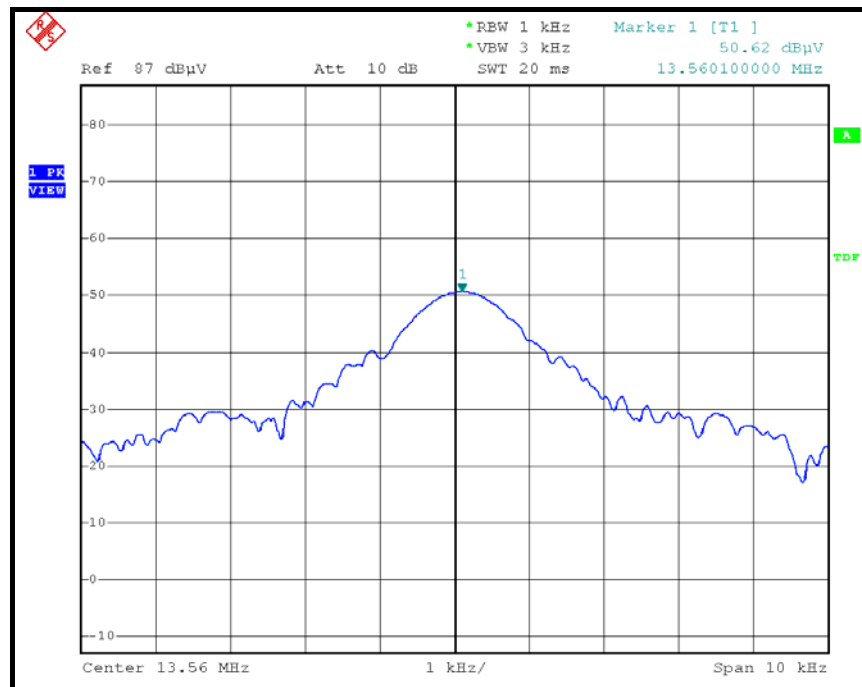
**REMARKS:**

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. Above limits have been translated by the formula

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\mu\text{V/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/3)^2 && 3\text{m} \\
 &= 124\text{dBuV/m}
 \end{aligned}$$





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|                        |              |                          |            |
|------------------------|--------------|--------------------------|------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR FUNCTION</b> | Quasi-Peak |
| <b>FREQUENCY RANGE</b> | 13.56MHz     |                          |            |

| ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m |             |                         |                |             |                    |                      |                  |                          |
|--|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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  | 13.56       | 50.4 QP                 | 124.0          | -73.6       | 1.0                | 154                  | 28.68            | 21.74                    |

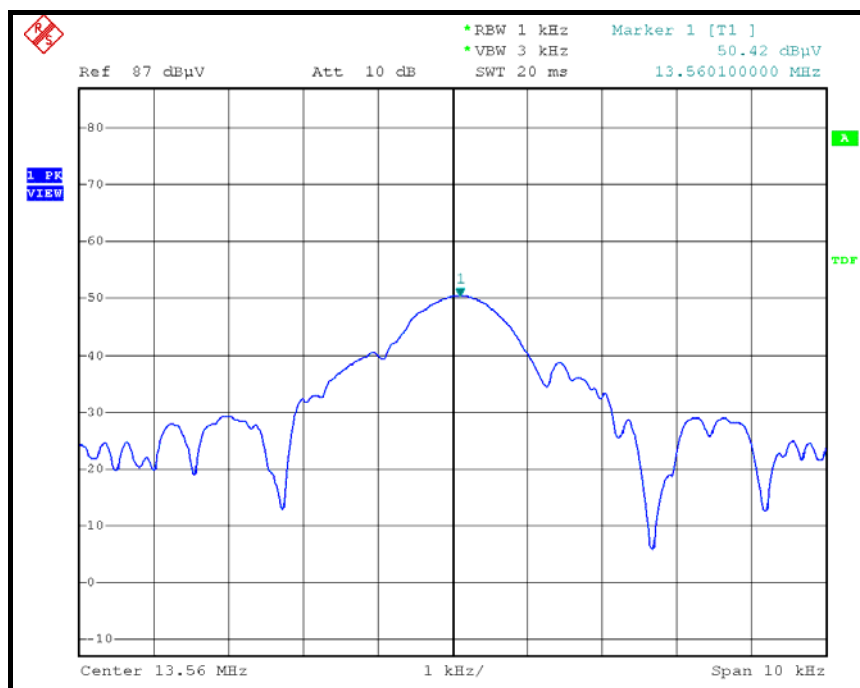
**REMARKS:**

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. Above limits have been translated by the formula

The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned}
 13.56\text{MHz} &= 15848\mu\text{V/m} && 30\text{m} \\
 &= 84\text{dBuV/m} && 30\text{m} \\
 &= 84+20\log(30/3)^2 && 3\text{m} \\
 &= 124\text{dBuV/m}
 \end{aligned}$$



|                        |              |                              |            |
|------------------------|--------------|------------------------------|------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak |
| <b>FREQUENCY RANGE</b> | 9kHz – 30MHz |                              |            |

| ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA OPEN AT 3m  |             |                         |                |             |                    |                      |                  |                          |
|--|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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  | 27.12       | 31.5 QP                 | 69.5           | -38.0       | 1.00 H             | 214                  | 8.27             | 23.25                    |
| ANTENNA POLARITY & TEST DISTANCE: LOOP ANTENNA CLOSE AT 3m |             |                         |                |             |                    |                      |                  |                          |
| 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  | 27.12       | 30.5 QP                 | 69.5           | -39.0       | 1.00 V             | 154                  | 7.20             | 23.25                    |

**REMARKS:**

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





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|                        |              |                          |            |
|------------------------|--------------|--------------------------|------------|
| <b>CHANNEL</b>         | TX Channel 1 | <b>DETECTOR FUNCTION</b> | Quasi-Peak |
| <b>FREQUENCY RANGE</b> | 30-1000MHz   |                          |            |

**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   | 41.16       | 29.2 QP                 | 40.0           | -10.8       | 1.15 H             | 317                  | 43.76            | -14.52                   |
| 2   | 91.74       | 30.9 QP                 | 43.5           | -12.6       | 1.23 H             | 10                   | 50.00            | -19.13                   |
| 3   | 160.27      | 28.1 QP                 | 43.5           | -15.4       | 1.53 H             | 146                  | 41.22            | -13.11                   |
| 4   | 199.90      | 30.4 QP                 | 43.5           | -13.2       | 1.64 H             | 287                  | 46.29            | -15.94                   |
| 5   | 301.75      | 29.0 QP                 | 46.0           | -17.0       | 1.17 H             | 79                   | 40.41            | -11.38                   |
| 6   | 603.51      | 26.9 QP                 | 46.0           | -19.1       | 1.34 H             | 289                  | 32.18            | -5.31                    |

**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   | 134.08      | 28.8 QP                 | 43.5           | -14.8       | 1.36 V             | 91                   | 42.84            | -14.09                   |
| 2   | 191.99      | 31.4 QP                 | 43.5           | -12.1       | 1.44 V             | 67                   | 47.30            | -15.86                   |
| 3   | 240.00      | 32.5 QP                 | 46.0           | -13.5       | 1.09 V             | 97                   | 46.60            | -14.06                   |
| 4   | 265.42      | 30.8 QP                 | 46.0           | -15.2       | 1.67 V             | 114                  | 43.63            | -12.79                   |
| 5   | 312.22      | 32.5 QP                 | 46.0           | -13.5       | 1.53 V             | 51                   | 43.54            | -11.05                   |
| 6   | 528.00      | 26.7 QP                 | 46.0           | -19.3       | 1.28 V             | 254                  | 33.64            | -6.90                    |

**REMARKS:**

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

## 4.2 CONDUCTED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15 ~ 0.5                  | 66 to 56                     | 56 to 46 |
| 0.5 ~ 5                     | 56                           | 46       |
| 5 ~ 30                      | 60                           | 50       |

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

### 4.2.2 TEST INSTRUMENTS

| Description & Manufacturer                                       | Model No.       | Serial No.   | Cal. Date     | Cal. Due      |
|--|-----------------|--------------|---------------|---------------|
| ROHDE & SCHWARZ<br>TEST RECEIVER                                 | ESCS 30         | 100276       | Jan. 07, 2014 | Jan. 06, 2015 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for EUT)         | ESH3-Z5         | 100219       | Nov. 17, 2013 | Nov. 16, 2014 |
| LISN With Adapter<br>(for EUT)                                   | AD10            | C10Ada-001   | Nov. 17, 2013 | Nov. 16, 2014 |
| ROHDE & SCHWARZ<br>Artificial Mains Network<br>(for peripherals) | ESH3-Z5         | 100218       | Nov. 25, 2013 | Nov. 24, 2014 |
| Software   | ADT_Cond_V7.3.7 | NA           | NA            | NA            |
| Software   | ADT_ISN_V7.3.7  | NA           | NA            | NA            |
| RF cable (JYEBAO)  | 5D-FB           | Cable-C10.01 | Feb. 19, 2013 | Feb. 18, 2014 |
| SUHNER Terminator<br>(For ROHDE & SCHWARZ<br>LISN)               | 65BNC-5001      | E1-010773    | Feb. 06, 2013 | Feb. 05, 2014 |
| Isolation Transformer<br>(Erika Fiedler)                         | D-65396         | 017          | Jul. 29, 2013 | Jul. 28, 2014 |

- 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 PROCEDURES

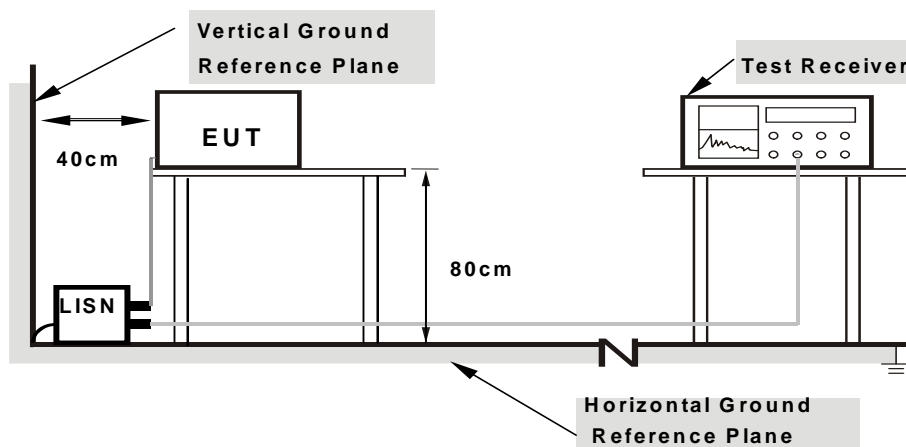
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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:** 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:**
- Support units were connected to second LISN.
  - Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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

### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6.

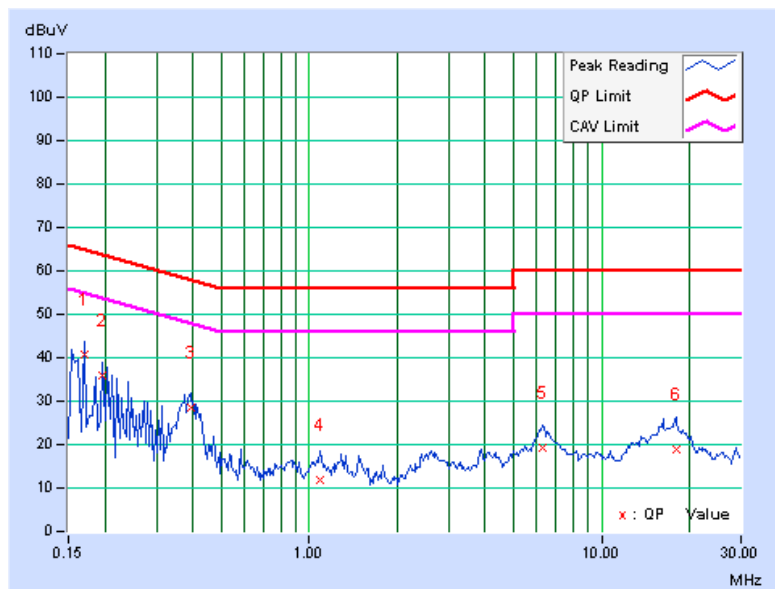
## 4.2.7 TEST RESULTS

|       |        |               |      |
|-------|--------|---------------|------|
| PHASE | Line 1 | 6dB BANDWIDTH | 9kHz |
|-------|--------|---------------|------|

| 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  | 0.16953        | 0.14                    | 40.63                      | 25.77 | 40.77                       | 25.91 | 64.98              | 54.98 | -24.21         | -29.07 |
| 2  | 0.19687        | 0.15                    | 35.93                      | 22.28 | 36.08                       | 22.43 | 63.74              | 53.74 | -27.66         | -31.31 |
| 3  | 0.39219        | 0.17                    | 28.34                      | 20.46 | 28.51                       | 20.63 | 58.02              | 48.02 | -29.51         | -27.39 |
| 4  | 1.08203        | 0.16                    | 11.68                      | 5.19  | 11.84                       | 5.35  | 56.00              | 46.00 | -44.16         | -40.65 |
| 5  | 6.27734        | 0.49                    | 18.82                      | 13.22 | 19.31                       | 13.71 | 60.00              | 50.00 | -40.69         | -36.29 |
| 6  | 18.05078       | 1.24                    | 17.57                      | 11.12 | 18.81                       | 12.36 | 60.00              | 50.00 | -41.19         | -37.64 |

### 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

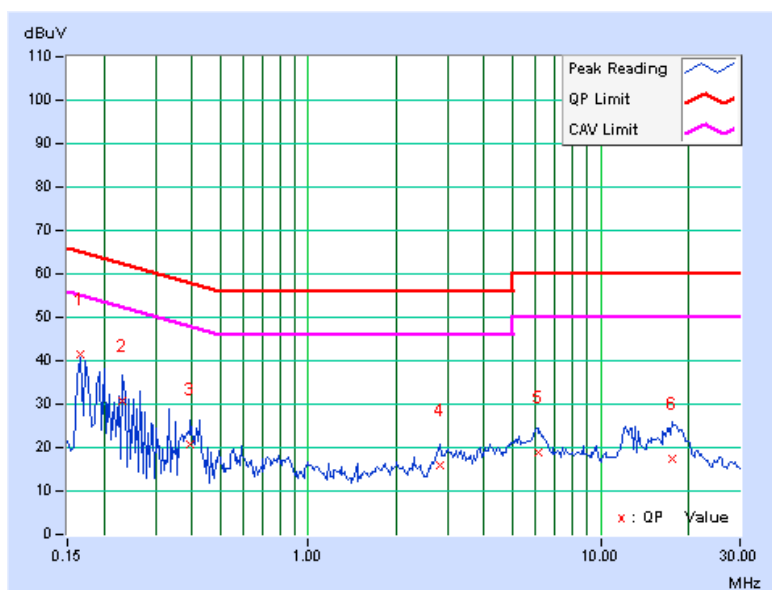


|       |        |               |      |
|-------|--------|---------------|------|
| PHASE | Line 2 | 6dB BANDWIDTH | 9kHz |
|-------|--------|---------------|------|

| 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  | 0.16562        | 0.53                    | 41.06                      | 26.24 | 41.59                       | 26.77 | 65.18              | 55.18 | -23.58         | -28.40 |
| 2  | 0.23203        | 0.53                    | 30.10                      | 15.19 | 30.63                       | 15.72 | 62.38              | 52.38 | -31.75         | -36.66 |
| 3  | 0.39609        | 0.54                    | 20.37                      | 11.44 | 20.91                       | 11.98 | 57.93              | 47.93 | -37.03         | -35.96 |
| 4  | 2.82422        | 0.55                    | 15.47                      | 10.01 | 16.02                       | 10.56 | 56.00              | 46.00 | -39.98         | -35.44 |
| 5  | 6.10938        | 0.66                    | 18.32                      | 12.96 | 18.98                       | 13.62 | 60.00              | 50.00 | -41.02         | -36.38 |
| 6  | 17.51172       | 1.24                    | 16.22                      | 9.73  | 17.46                       | 10.97 | 60.00              | 50.00 | -42.54         | -39.03 |

**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 FREQUENCY STABILITY

#### 4.3.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

#### 4.3.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER     | MODEL NO. | SERIAL NO. | DATE OF CALIBRATION | DUE DATE OF CALIBRATION |
|--------------------------------|-----------|------------|---------------------|-------------------------|
| R&S SPECTRUM ANALYZER          | FSP 40    | 100036     | May. 17, 2013       | May. 16, 2014           |
| Temperature & Humidity Chamber | MHU-225AU | 920409     | May 23, 2013        | May 22, 2014            |

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

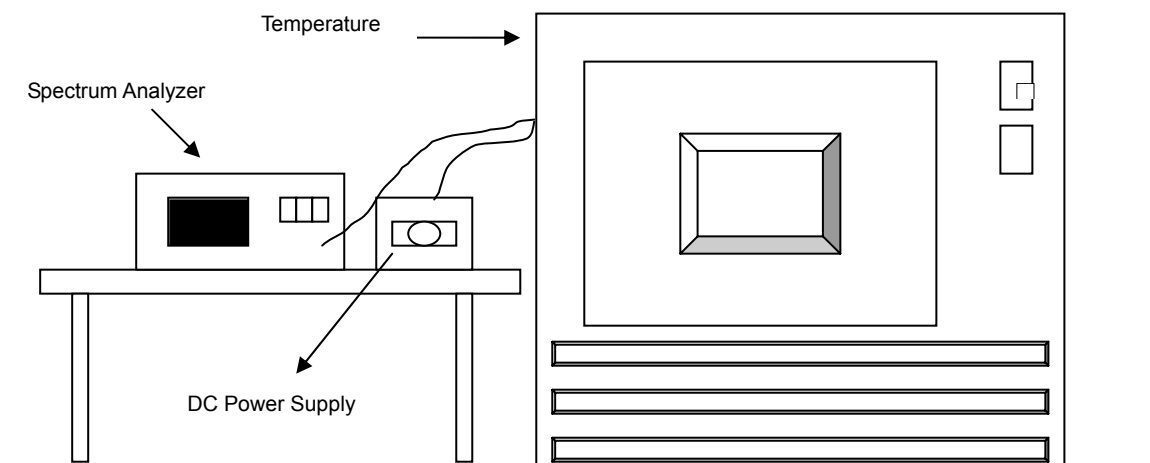
#### 4.3.3 TEST PROCEDURE

- a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- b. Turn the EUT on and couple its output to a spectrum analyzer.
- c. Turn the EUT off and set the chamber to the highest temperature specified.
- d. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency after 2, 5, and 10 minutes.
- e. Repeat step b and c with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.5 TEST SETUP



#### 4.3.6 EUT OPERATING CONDITION

Same as Item 4.1.6.

### 4.3.7 TEST RESULTS

| OPERATING FREQUENCY: 13.56MHz |                       | LIMIT: $\pm 0.01\%$ |          |
|-------------------------------|-----------------------|---------------------|----------|
| TEMP.<br>(°C)                 | POWER SUPPLY<br>(Vac) | (MHz)               | (%)      |
| 20                            | 120                   | 13.5600             | 0        |
|                               | 138                   | 13.5605             | 0.00147  |
|                               | 102                   | 13.5598             | -0.00074 |
| -20                           | 120                   | 13.5610             | 0.00368  |
| 55                            | 120                   | 13.5595             | -0.00368 |

**Note:** Operating temperature of EUT is -20 degrees C to 55 degrees C.



## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6. INFORMATION ON THE TESTING LABORATORIES

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

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

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

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

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

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

--- END ---