

## FCC Test Report

**Report No.:** RF160621C08-5

**FCC ID:** H8N-PCT5230

**Test Model:** ADR1776

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

**Test Date:** Aug. 23 ~ Aug. 24, 2016

**Issued Date:** Aug. 25, 2016

**Applicant:** ASKEY COMPUTER CORP.

**Address:** 10F, NO. 119, JIANKANG RD., ZHONGHE DIST., NEW TAIPEI CITY 23585,  
TAIWAN, R.O.C.

**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.)



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### Release Control Record

| Issue No.     | Description       | Date Issued   |
|---------------|-------------------|---------------|
| RF160621C08-5 | Original release. | Aug. 25, 2016 |

## 1 Certificate of Conformity

**Product:** Smart Phone

**Brand:** Turbonet

**Test Model:** ADR1776

**Sample Status:** Engineering sample

**Applicant:** ASKEY COMPUTER CORP.

**Test Date:** Aug. 18 ~ Aug. 23, 2016

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.225)  
47 CFR FCC Part 15, Subpart C (Section 15.215)  
ANSI C63.10:2013

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

**Prepared by :** Celine Chou , **Date:** Aug. 25, 2016  
Celine Chou / Specialist

**Approved by :** Ken Liu , **Date:** Aug. 25, 2016  
Ken Liu / Senior Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.225, 15.215) |                                                                                              |        |                                                                                    |
|--------------------------------------------------------|----------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------|
| FCC Clause                                             | Test Item                                                                                    | Result | Remarks                                                                            |
| 15.207                                                 | Conducted emission test                                                                      | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -1.05dB at 13.56130MHz |
| 15.225 (a)                                             | The field strength of any emissions within the band 13.553-13.567 MHz                        | Pass   | Meet the requirement of limit.<br>Minimum passing margin is -67.60dB at 13.56MHz.  |
| 15.225 (b)                                             | The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz | Pass   | Meet the requirement of limit.                                                     |
| 15.225 (c)                                             | The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz | Pass   | Meet the requirement of limit.                                                     |
| 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.<br>Minimum passing margin is -2.4dB at 39.62MHz.    |
| 15.225 (e)                                             | The frequency tolerance                                                                      | Pass   | Meet the requirement of limit.                                                     |
| 15.215 (c)                                             | 20dB Bandwidth                                                                               | 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        | Expanded Uncertainty (k=2) ( $\pm$ ) |
|------------------------------------|------------------|--------------------------------------|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz   | 2.44 dB                              |
| Radiated Emissions up to 1 GHz     | 30MHz ~ 200MHz   | 3.63 dB                              |
|                                    | 200MHz ~ 1000MHz | 3.64 dB                              |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

|                     |                                                                                |
|---------------------|--------------------------------------------------------------------------------|
| Product             | Smart Phone                                                                    |
| Brand               | Turbonet                                                                       |
| Test Model          | ADR1776                                                                        |
| Sample Status       | Engineering sample                                                             |
| Power Supply Rating | 3.8Vdc (Battery)<br>5Vdc or 9Vdc (Adapter or host equipment)<br>9Vdc (Adapter) |
| Modulation Type     | ASK                                                                            |
| Operating Frequency | 13.56MHz                                                                       |
| Antenna Type        | Loop antenna                                                                   |
| Accessory Device    | NA                                                                             |
| Data Cable Supplied | NA                                                                             |

Note:

1. The EUT contains following accessory devices and data cable.

| Item      | Brand                   | Model      | Specification                                                                    |
|-----------|-------------------------|------------|----------------------------------------------------------------------------------|
| Battery   | FUJI                    | 492005     | 3.8Vdc, 11.21Wh or 2950mAh                                                       |
| USB cable | N/A                     | N/A        | 0.95m shielded cable without core                                                |
| Adapter   | DELTA Electronics, INC. | ADP-18GW B | I/P: 100-240Vac, 0.5A, 50-60Hz<br>O/P: 5Vdc, 2A charger<br>9Vdc, 2A fast charger |

#### 3.2 Description of Test Modes

1 channel is provided to this EUT

| Channel | FREQ. (MHz) |
|---------|-------------|
| 1       | 13.56       |

### 3.2.1 Test Mode Applicability and Tested Channel Data

| EUT CONFIGURE MODE | APPLICABLE TO |     |    |    | DESCRIPTION        |
|--------------------|---------------|-----|----|----|--------------------|
|                    | RE            | PLC | FS | EB |                    |
| -                  | √             | √   | √  | √  | Powered by adapter |

Where **RE:** Radiated Emission **PLC:** Power Line Conducted Emission  
**FS:** Frequency Stability **EB:** 20dB Bandwidth measurement

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

#### **Radiated 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 CONFIGUURE MODE | 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, 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 CONFIGUURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---------------------|-------------------|----------------|-----------------|
| -                   | 1                 | 1              | ASK             |

#### **20dB Bandwidth:**

- ☒ 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 CONFIGUURE MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---------------------|-------------------|----------------|-----------------|
| -                   | 1                 | 1              | ASK             |

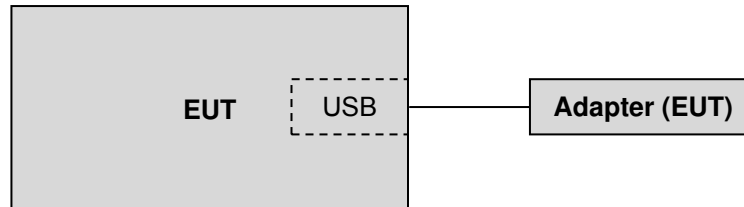
#### **Test Condition:**

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY   |
|---------------|--------------------------|----------------------|-------------|
| RE            | 18deg. C, 70%RH          | 120Vac, 60Hz         | Jones Chang |
| PLC           | 24deg. C, 64%RH          | 120Vac, 60Hz         | Match Tsui  |
| FS            | 24deg. C, 64%RH          | 120Vac, 60Hz         | Match Tsui  |
| BW            | 24deg. C, 64%RH          | 120Vac, 60Hz         | Match Tsui  |

### 3.3 Description of Support Units

The EUT has been tested as an independent unit.

#### 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 (15.225)**

**FCC Part 15, Subpart C (15.215)**

ANSI C63.10-2013

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

Note: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission 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.

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 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. 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     | ESCS30                       | 100289                          | Dec. 23, 2015 | Dec. 22, 2016 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ | FSP40                        | 100269                          | Apr. 19, 2016 | Apr. 18, 2017 |
| BILOG Antenna<br>SCHWARZBECK         | VULB9168                     | 9168-148                        | Jan. 18, 2016 | Jan. 17, 2017 |
| HORN Antenna<br>SCHWARZBECK          | BBHA 9120 D                  | 9120D-1169                      | Jan. 08, 2016 | Jan. 07, 2017 |
| HORN Antenna<br>SCHWARZBECK          | BBHA 9170                    | BBHA9170241                     | Jan. 18, 2016 | Jan. 17, 2017 |
| Loop Antenna<br>R&S                  | HFH2-Z2                      | 100070                          | Mar. 24, 2016 | Mar. 23, 2018 |
| Preamplifier<br>Agilent              | 8449B                        | 3008A01911                      | Aug. 09, 2016 | Aug. 08, 2017 |
| Preamplifier<br>Agilent              | 8447D                        | 2944A10638                      | Aug. 09, 2016 | Aug. 08, 2017 |
| RF signal cable<br>HUBER+SUHNER      | SUCOFLEX 104                 | CABLE-CH9-02(309222<br>+248780) | Aug. 09, 2016 | Aug. 08, 2017 |
| RF signal cable<br>HUBER+SUHNER      | SUCOFLEX 104                 | CABLE-CH9-03(274092<br>)        | Aug. 09, 2016 | Aug. 08, 2017 |
| RF signal cable<br>Woken             | 8D-FB                        | Cable-CH9-01                    | Aug. 09, 2016 | Aug. 08, 2017 |
| Software<br>BV ADT                   | ADT_Radiated_<br>V7.6.15.9.4 | NA                              | NA            | NA            |
| Antenna Tower<br>EMCO                | 2070/2080                    | 512.835.4684                    | NA            | NA            |
| Turn Table<br>EMCO                   | 2087-2.03                    | NA                              | NA            | NA            |
| Antenna Tower & Turn<br>BV ADT       | AT100                        | AT93021705                      | NA            | NA            |
| Turn Table<br>BV ADT                 | TT100                        | TT93021705                      | NA            | NA            |
| Turn Table Controller<br>BV ADT      | SC100                        | SC93021705                      | 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 Chamber 9.
3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 215374.
5. The IC Site Registration No. is IC 7450F-9.
6. The calibration interval of the loop antenna is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 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 meters 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. Height of receiving 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.

**Note:**

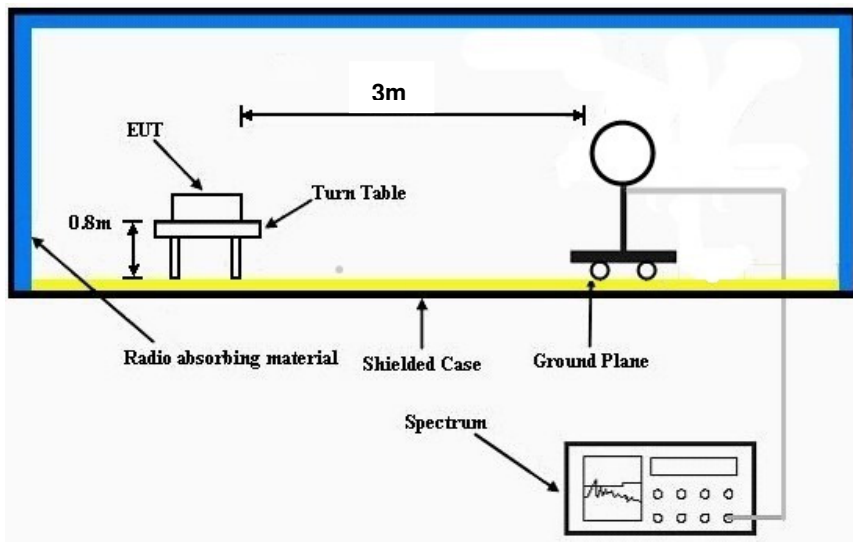
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10Hz (Duty cycle  $> 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.
5. These test were performed other than open test site, adequate comparison measurements were confirmed against 30m open test site. Therefore sufficient were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB937606.

#### 4.1.4 Deviation from Test Standard

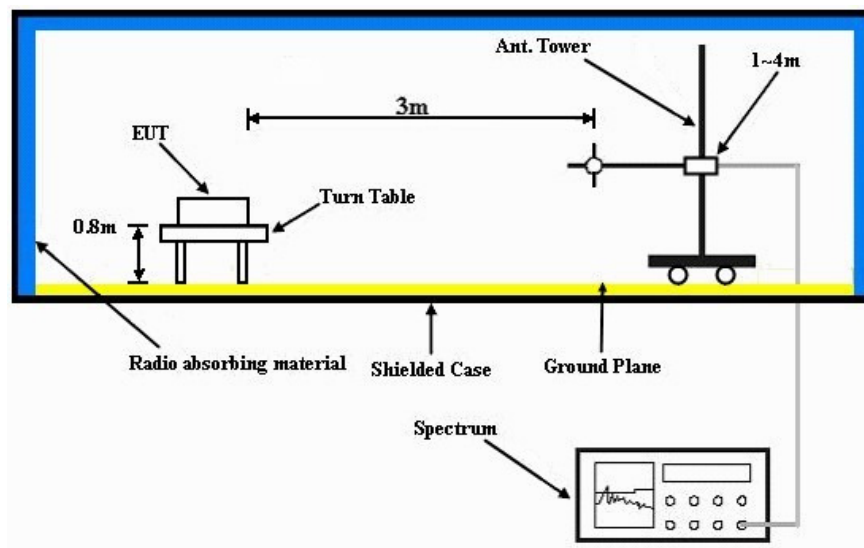
No deviation.

#### 4.1.5 Test Set Up

<Frequency Range 9kHz ~ 30MHz >



<Frequency Range above 30MHz>



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

#### 4.1.6 EUT Operating Conditions

Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

| EUT Test Condition       |                 | Measurement Detail |                    |
|--------------------------|-----------------|--------------------|--------------------|
| Channel                  | Channel 1       | Frequency Range    | 13.553 ~ 13.567MHz |
| Input Power              | 120Vac, 60Hz    | Detector Function  | Quasi-Peak         |
| Environmental Conditions | 18deg. C, 70%RH | Tested By          | Jones Chang        |

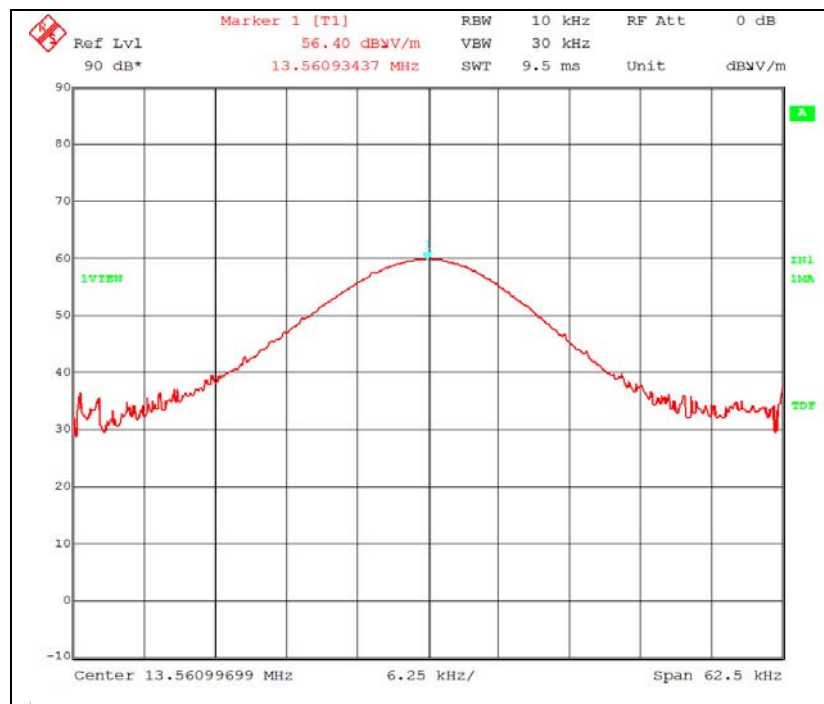
| Antenna Polarity & Test Distance: Loop Antenna Open At 3m |             |                         |                |             |                    |                      |                  |                          |
|-----------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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       | 56.40                   | 124.00         | -67.60      | 1                  | 289                  | 59.70            | -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. 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:

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



| EUT Test Condition       |                 | Measurement Detail |                    |
|--------------------------|-----------------|--------------------|--------------------|
| Channel                  | Channel 1       | Frequency Range    | 13.553 ~ 13.567MHz |
| Input Power              | 120Vac, 60Hz    | Detector Function  | Quasi-Peak         |
| Environmental Conditions | 18deg. C, 70%RH | Tested By          | Jones Chang        |

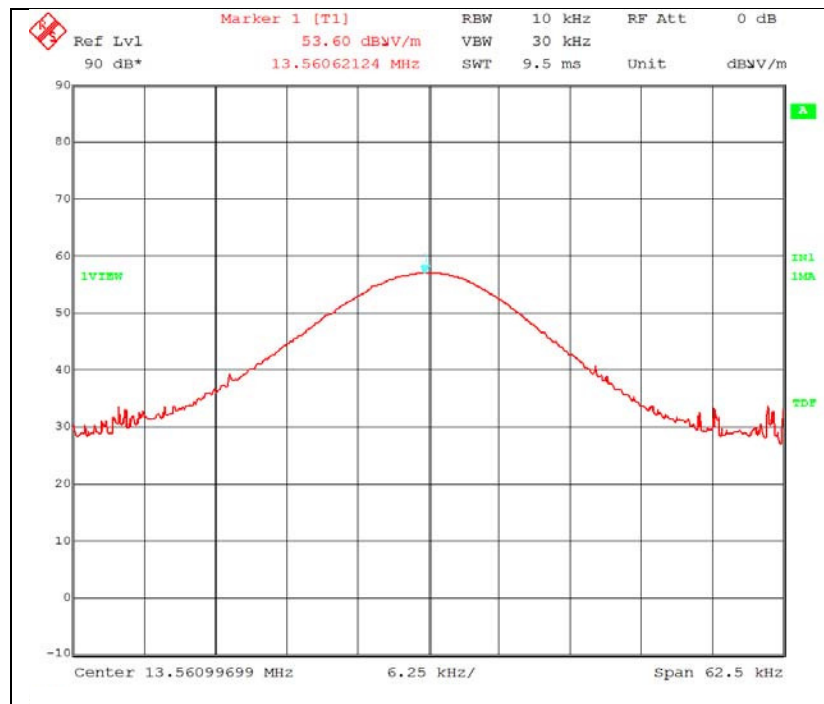
| Antenna Polarity & Test Distance: Loop Antenna Close At 3m |             |                         |                |             |                    |                      |                  |                          |
|------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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       | 53.60                   | 124.00         | -70.40      | 1                  | 178                  | 56.90            | -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. 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:

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

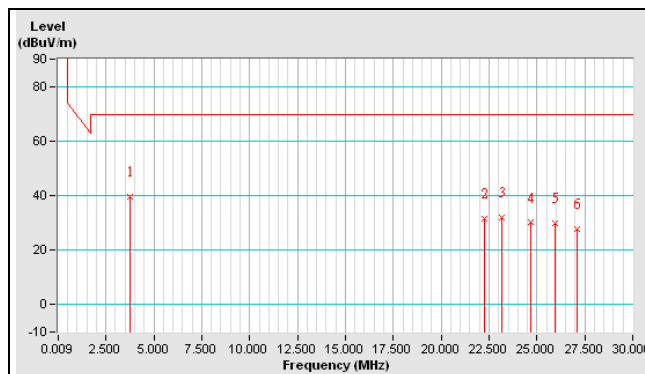


| EUT Test Condition       |                 | Measurement Detail |             |
|--------------------------|-----------------|--------------------|-------------|
| Channel                  | Channel 1       | Frequency Range    | Below 30MHz |
| Input Power              | 120Vac, 60Hz    | Detector Function  | Quasi-Peak  |
| Environmental Conditions | 18deg. C, 70%RH | Tested By          | Jones Chang |

| 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                                                         | 3.74        | 39.7                    | 69.5           | -29.8       | 1                  | 122                  | 42.6             | -2.9                     |
| 2                                                         | 22.25       | 31.5                    | 69.5           | -38.0       | 1                  | 226                  | 35.5             | -4.0                     |
| 3                                                         | 23.15       | 32.1                    | 69.5           | -37.4       | 1                  | 260                  | 35.8             | -3.7                     |
| 4                                                         | 24.65       | 30.0                    | 69.5           | -39.5       | 1                  | 49                   | 33.4             | -3.4                     |
| 5                                                         | 25.97       | 29.8                    | 69.5           | -39.7       | 1                  | 167                  | 32.9             | -3.1                     |
| 6                                                         | 27.12       | 27.9                    | 69.5           | -41.6       | 1                  | 308                  | 30.7             | -2.8                     |

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

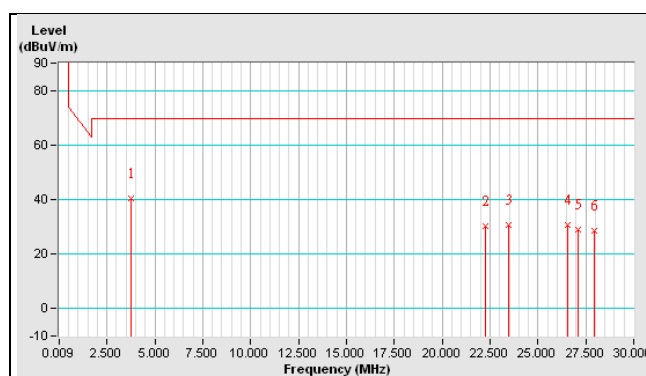


| EUT Test Condition       |                 | Measurement Detail |             |
|--------------------------|-----------------|--------------------|-------------|
| Channel                  | Channel 1       | Frequency Range    | Below 30MHz |
| Input Power              | 120Vac, 60Hz    | Detector Function  | Quasi-Peak  |
| Environmental Conditions | 18deg. C, 70%RH | Tested By          | Jones Chang |

| 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                                                          | 3.74        | 40.3                    | 69.5           | -29.2       | 1                  | 191                  | 43.2             | -2.9                     |
| 2                                                          | 22.25       | 30.2                    | 69.5           | -39.3       | 1                  | 180                  | 34.2             | -4.0                     |
| 3                                                          | 23.45       | 30.6                    | 69.5           | -38.9       | 1                  | 96                   | 34.3             | -3.7                     |
| 4                                                          | 26.57       | 30.6                    | 69.5           | -38.9       | 1                  | 172                  | 33.5             | -2.9                     |
| 5                                                          | 27.12       | 28.9                    | 69.5           | -40.6       | 1                  | 72                   | 31.7             | -2.8                     |
| 6                                                          | 27.96       | 28.4                    | 69.5           | -41.1       | 1                  | 82                   | 31.1             | -2.7                     |

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



| EUT Test Condition       |                 | Measurement Detail |               |
|--------------------------|-----------------|--------------------|---------------|
| Channel                  | Channel 1       | Frequency Range    | Below 1000MHz |
| Input Power              | 120Vac, 60Hz    | Detector Function  | Quasi-Peak    |
| Environmental Conditions | 18deg. C, 70%RH | Tested By          | Jones Chang   |

| Antenna Polarity & Test Distance: Horizontal 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                                                  | 57.12        | 30.2 QP                 | 40.0           | -9.8        | 2.00 H             | 148                  | 44.8             | -14.6                    |
| 2                                                  | 80.45        | 32.4 QP                 | 40.0           | -7.6        | 2.00 H             | 179                  | 51.0             | -18.6                    |
| 3                                                  | 136.84       | 28.1 QP                 | 43.5           | -15.4       | 1.00 H             | 114                  | 43.0             | -14.9                    |
| 4                                                  | 175.72       | 29.5 QP                 | 43.5           | -14.0       | 2.00 H             | 82                   | 44.1             | -14.6                    |
| 5                                                  | 202.94       | 29.3 QP                 | 43.5           | -14.2       | 2.00 H             | 35                   | 45.9             | -16.6                    |
| 6                                                  | 498.47       | 30.9 QP                 | 46.0           | -15.1       | 2.00 H             | 321                  | 38.9             | -8.0                     |
| Antenna Polarity & Test Distance: Vertical 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) |
| <b>1</b>                                           | <b>39.62</b> | <b>37.6 QP</b>          | <b>40.0</b>    | <b>-2.4</b> | <b>1.00 V</b>      | <b>268</b>           | <b>52.8</b>      | <b>-15.2</b>             |
| 2                                                  | 66.84        | 33.9 QP                 | 40.0           | -6.1        | 1.00 V             | 50                   | 49.7             | -15.8                    |
| 3                                                  | 80.45        | 33.5 QP                 | 40.0           | -6.5        | 1.00 V             | 181                  | 52.1             | -18.6                    |
| 4                                                  | 175.72       | 28.5 QP                 | 43.5           | -15.0       | 1.00 V             | 268                  | 43.1             | -14.6                    |
| 5                                                  | 500.42       | 29.0 QP                 | 46.0           | -17.0       | 1.50 V             | 176                  | 36.9             | -7.9                     |
| 6                                                  | 747.34       | 34.1 QP                 | 46.0           | -11.9       | 1.50 V             | 16                   | 36.3             | -2.2                     |

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. 16, 2015 | Nov. 15, 2016 |
| RF signal cable (with 10dB PAD)<br>Woken    | 5D-FB                    | Cable-cond1-01 | Dec. 26, 2015 | Dec. 25, 2016 |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(EUT)        | ESH3-Z5                  | 835239/001     | Feb. 26, 2016 | Feb. 25, 2017 |
| LISN/AMN<br>ROHDE & SCHWARZ<br>(Peripheral) | ESH3-Z5                  | 100311         | Jul. 28, 2016 | Jul. 27, 2017 |
| Software<br>ADT                             | BV ADT_Cond_<br>V7.3.7.3 | NA             | NA            | NA            |

**Note:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
2. The test was performed in HwaYa Shielded Room 1.  
3. The VCCI Site Registration No. is C-2040.

### 4.2.3 Test Procedures

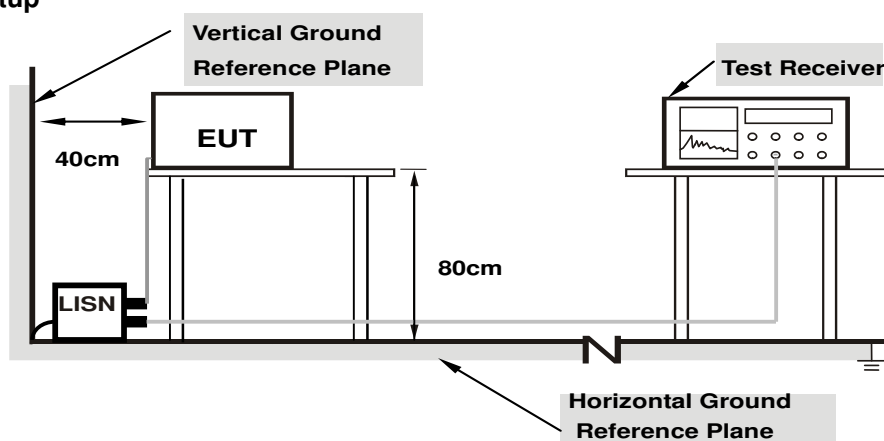
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

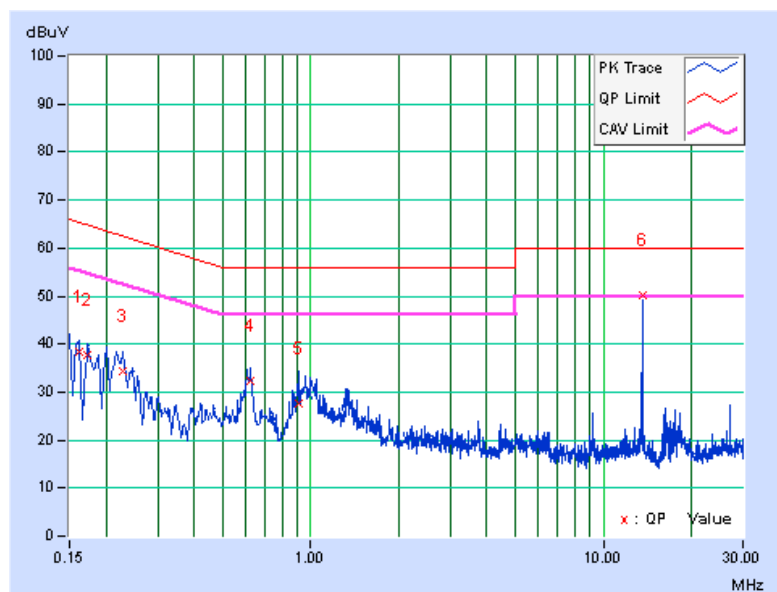
#### 4.2.7 Test Results

| 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  | 0.16173        | 10.08                   | 28.17                      | 15.27 | 38.25                       | 25.35 | 65.37              | 55.37 | -27.12         | -30.02 |
| 2  | 0.17346        | 10.08                   | 27.71                      | 16.60 | 37.79                       | 26.68 | 64.79              | 54.79 | -27.00         | -28.11 |
| 3  | 0.22820        | 10.09                   | 24.39                      | 15.80 | 34.48                       | 25.89 | 62.51              | 52.51 | -28.03         | -26.62 |
| 4  | 0.62311        | 10.21                   | 22.02                      | 16.95 | 32.23                       | 27.16 | 56.00              | 46.00 | -23.77         | -18.84 |
| 5  | 0.91245        | 10.27                   | 17.28                      | 12.02 | 27.55                       | 22.29 | 56.00              | 46.00 | -28.45         | -23.71 |
| 6  | 13.56130       | 10.98                   | 39.27                      | 36.07 | 50.25                       | 47.05 | 60.00              | 50.00 | -9.75          | -2.95  |

#### 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.

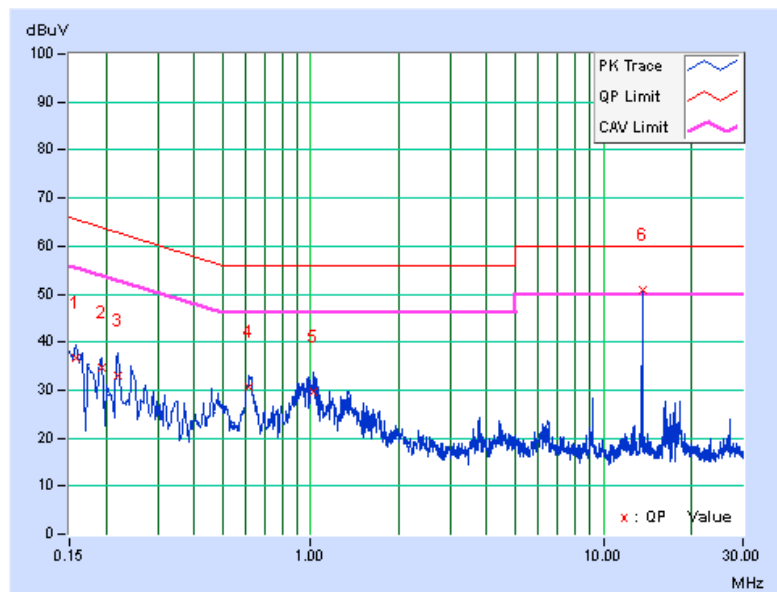


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| 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  | 0.15760        | 10.08                   | 26.61                      | 14.25 | 36.69                       | 24.33 | 65.59              | 55.59 | -28.90         | -31.26 |
| 2  | 0.19305        | 10.08                   | 24.64                      | 12.34 | 34.72                       | 22.42 | 63.90              | 53.90 | -29.18         | -31.48 |
| 3  | 0.22024        | 10.10                   | 23.02                      | 11.94 | 33.12                       | 22.04 | 62.81              | 52.81 | -29.69         | -30.77 |
| 4  | 0.61543        | 10.26                   | 20.41                      | 15.42 | 30.67                       | 25.68 | 56.00              | 46.00 | -25.33         | -20.32 |
| 5  | 1.02607        | 10.29                   | 19.48                      | 14.40 | 29.77                       | 24.69 | 56.00              | 46.00 | -26.23         | -21.31 |
| 6  | 13.56130       | 11.09                   | 39.85                      | 37.86 | 50.94                       | 48.95 | 60.00              | 50.00 | -9.06          | -1.05  |

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.

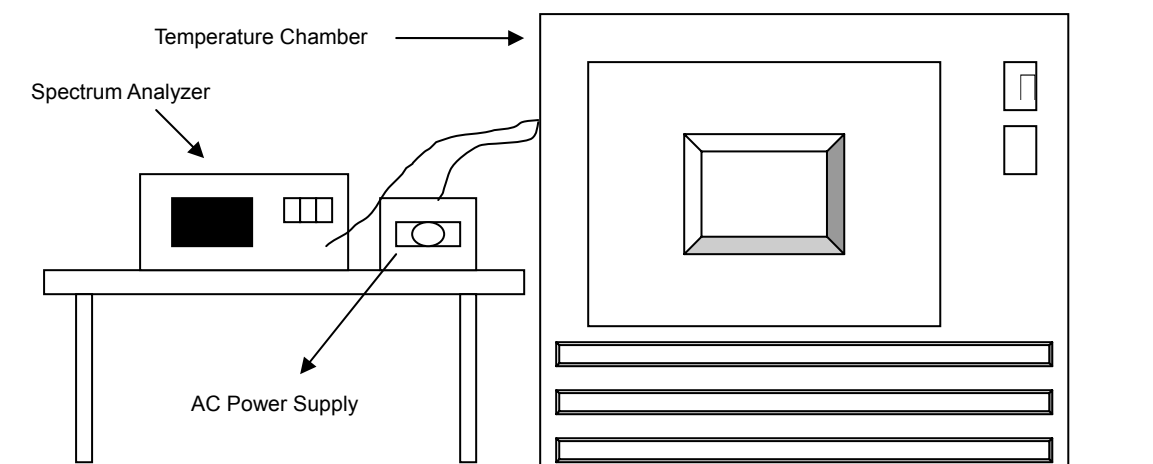


### 4.3 Frequency Stability

#### 4.3.1 Limits of Frequency Stability Measurement

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  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 Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turned the EUT on and coupled its output to a spectrum analyzer.
- Turned the EUT off and set the chamber to the highest temperature specified.
- Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.
- 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.

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

#### 4.3.7 Test Result

| Frequency Stability Versus Temp. |                          |                       |                    |                       |                    |                       |                    |                       |                    |
|----------------------------------|--------------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| TEMP.<br>(°C)                    | Power<br>Supply<br>(Vac) | 0 Minute              |                    | 2 Minute              |                    | 5 Minute              |                    | 10 Minute             |                    |
|                                  |                          | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift |
|                                  |                          | (MHz)                 | %                  | (MHz)                 | %                  | (MHz)                 | %                  | (MHz)                 | %                  |
| 50                               | 120                      | 13.560001             | 0.00001            | 13.559985             | -0.00011           | 13.559993             | -0.00005           | 13.559981             | -0.00014           |
| 40                               | 120                      | 13.559991             | -0.00007           | 13.559985             | -0.00011           | 13.559981             | -0.00014           | 13.559993             | -0.00005           |
| 30                               | 120                      | 13.559957             | -0.00032           | 13.559964             | -0.00027           | 13.559967             | -0.00024           | 13.559955             | -0.00033           |
| 20                               | 120                      | 13.559996             | -0.00003           | 13.559984             | -0.00012           | 13.559984             | -0.00012           | 13.55999              | -0.00007           |
| 10                               | 120                      | 13.559942             | -0.00043           | 13.559959             | -0.00030           | 13.559939             | -0.00045           | 13.559942             | -0.00043           |
| 0                                | 120                      | 13.560036             | 0.00027            | 13.560045             | 0.00033            | 13.560051             | 0.00038            | 13.560046             | 0.00034            |
| -10                              | 120                      | 13.55997              | -0.00022           | 13.55998              | -0.00015           | 13.559988             | -0.00009           | 13.559979             | -0.00015           |
| -20                              | 120                      | 13.560028             | 0.00021            | 13.560029             | 0.00021            | 13.560027             | 0.00020            | 13.56003              | 0.00022            |

| Frequency Stability Versus Voltage |                          |                       |                    |                       |                    |                       |                    |                       |                    |
|------------------------------------|--------------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| TEMP.<br>(°C)                      | Power<br>Supply<br>(Vac) | 0 Minute              |                    | 2 Minute              |                    | 5 Minute              |                    | 10 Minute             |                    |
|                                    |                          | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift | Measured<br>Frequency | Frequency<br>Drift |
|                                    |                          | (MHz)                 | %                  | (MHz)                 | %                  | (MHz)                 | %                  | (MHz)                 | %                  |
| 20                                 | 132                      | 13.559994             | -0.00004           | 13.559984             | -0.00012           | 13.559983             | -0.00013           | 13.559989             | -0.00008           |
|                                    | 120                      | 13.559996             | -0.00003           | 13.559984             | -0.00012           | 13.559984             | -0.00012           | 13.55999              | -0.00007           |
|                                    | 108                      | 13.559996             | -0.00003           | 13.559985             | -0.00011           | 13.559982             | -0.00013           | 13.559991             | -0.00007           |

#### **4.4 20dB bandwidth**

##### **4.4.1 Limits of 20dB Bandwidth Measurement**

The 20dB bandwidth shall be specified in operating frequency band.

##### **4.4.2 Test Setup**

Same as Item 4.1.5.

##### **4.4.3 Test Instruments**

Refer to section 4.1.2 to get information of above instrument.

##### **4.4.4 Test Procedures**

The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

##### **4.4.5 Deviation from Test Standard**

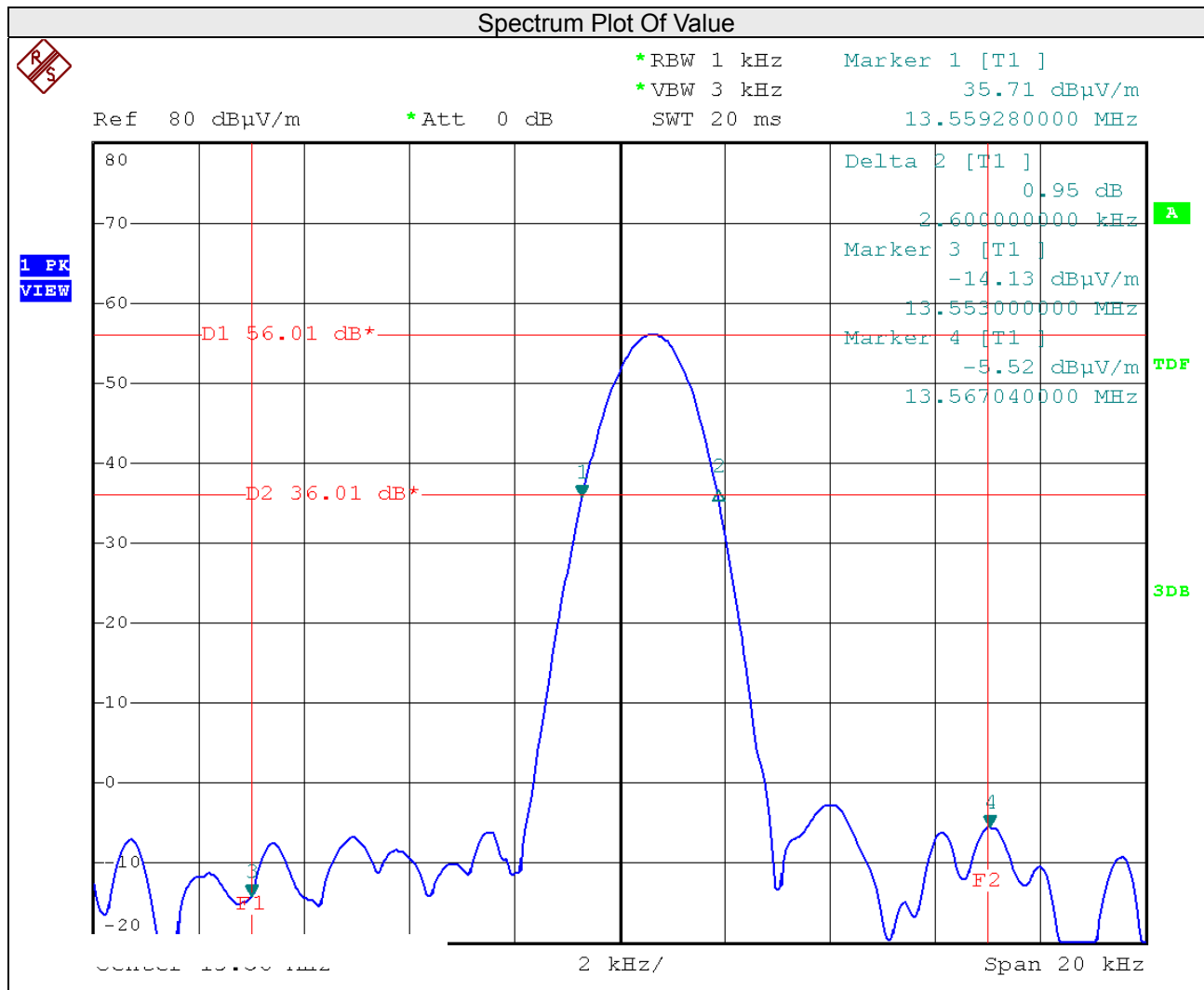
No deviation.

##### **4.4.6 EUT Operating Conditions**

Same as Item 4.1.6.

#### 4.4.7 Test Results

| 20dBc point (Low) | 20dBc point (High) | Operating frequency band (MHz) | Pass / Fail |
|-------------------|--------------------|--------------------------------|-------------|
| 13.55928          | 13.56188           | 13.553~13.567                  | Pass        |



## 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.

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

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