

## FCC Test Report

**Report No.:** RF181031C07

**FCC ID:** PZWWDWI003

**Model:** DWI003

**Received Date:** Jan. 02, 2018

**Test Date:** Jul. 18 ~ Jul. 19, 2018

**Issued Date:** Nov. 01, 2018

**Applicant:** DENSO WAVE INCORPORATED

**Address:** 1, Yoshiike, Kusagi, Agui-cho, Chita-gun, Aichi, 470-2297 Japan

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

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

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

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



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

## Table of Contents

|                                                                 |           |
|-----------------------------------------------------------------|-----------|
| <b>Release Control Record .....</b>                             | <b>3</b>  |
| <b>1 Certificate of Conformity.....</b>                         | <b>4</b>  |
| <b>2 Summary of Test Results .....</b>                          | <b>5</b>  |
| 2.1 Measurement Uncertainty .....                               | 5         |
| 2.2 Modification Record .....                                   | 5         |
| <b>3 General Information.....</b>                               | <b>6</b>  |
| 3.1 General Description of EUT .....                            | 6         |
| 3.2 Description of Test Modes .....                             | 7         |
| 3.2.1 Test Mode Applicability and Tested Channel Deta .....     | 8         |
| 3.3 Description of Support Units .....                          | 9         |
| 3.3.1 Configuration of System under Test .....                  | 9         |
| 3.4 General Description of Applied Standards .....              | 9         |
| <b>4 Test Types and Results .....</b>                           | <b>10</b> |
| 4.1 Radiated Emission Measurement .....                         | 10        |
| 4.1.1 Limits of Radiated Emission Measurement .....             | 10        |
| 4.1.2 Test Instruments .....                                    | 11        |
| 4.1.3 Test Procedures.....                                      | 12        |
| 4.1.4 Deviation from Test Standard .....                        | 13        |
| 4.1.5 Test Set Up .....                                         | 13        |
| 4.1.6 EUT Operating Conditions.....                             | 14        |
| 4.1.7 Test Results .....                                        | 15        |
| 4.2 Conducted Emission Measurement .....                        | 22        |
| 4.2.1 Limits of Conducted Emission Measurement .....            | 22        |
| 4.2.2 Test Instruments .....                                    | 22        |
| 4.2.3 Test Procedures.....                                      | 22        |
| 4.2.4 Deviation from Test Standard .....                        | 22        |
| 4.2.5 Test Setup.....                                           | 23        |
| 4.2.6 EUT Operating Conditions.....                             | 23        |
| 4.2.7 Test Results .....                                        | 24        |
| 4.3 Frequency Stability.....                                    | 26        |
| 4.3.1 Limits of Frequency Stability Measurement .....           | 26        |
| 4.3.2 Test Setup.....                                           | 26        |
| 4.3.3 Test Instruments .....                                    | 26        |
| 4.3.4 Test Procedure .....                                      | 26        |
| 4.3.5 Deviation fromTest Standard .....                         | 26        |
| 4.3.6 EUT Operating Conditions.....                             | 26        |
| 4.3.7 Test Result.....                                          | 27        |
| 4.4 20dB Bandwidth .....                                        | 28        |
| 4.4.1 Limits of 20dB Bandwidth Measurement .....                | 28        |
| 4.4.2 Test Setup.....                                           | 28        |
| 4.4.3 Test Instruments .....                                    | 28        |
| 4.4.4 Test Procedures.....                                      | 28        |
| 4.4.5 Deviation from Test Standard .....                        | 28        |
| 4.4.6 EUT Operating Conditions.....                             | 28        |
| 4.4.7 Test Results .....                                        | 29        |
| <b>5 Pictures of Test Arrangements.....</b>                     | <b>30</b> |
| <b>Appendix – Information on the Testing Laboratories .....</b> | <b>31</b> |

### Release Control Record

| Issue No.   | Description      | Date Issued   |
|-------------|------------------|---------------|
| RF181031C07 | Original release | Nov. 01, 2018 |

## 1 Certificate of Conformity

**Product:** NFC Module

**Brand:** DENSO

**Model:** DWI003

**Sample Status:** Engineering sample

**Applicant:** DENSO WAVE INCORPORATED

**Test Date:** Jul. 18 ~ Jul. 19, 2018

**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 RF characteristics under the conditions specified in this report.

**Prepared by :** Pettie Chen, **Date:** Nov. 01, 2018  
Pettie Chen / Senior Specialist

**Approved by :** Bruce Chen, **Date:** Nov. 01, 2018  
Bruce Chen / Project Engineer

## 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 -15.48dB 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 -67.1dB 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 -13.1dB at 747.85MHz.   |
| 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   | 2.94 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             | NFC Module                          |
| Brand               | DENSO                               |
| Model               | DWI003                              |
| Sample Status       | Engineering sample                  |
| Power Supply Rating | 3.85Vdc (battery)<br>12Vdc (Cradle) |
| Modulation Type     | ASK                                 |
| Operating Frequency | 13.56MHz                            |
| Antenna Type        | Loop antenna                        |
| Accessory Device    | NA                                  |
| Data Cable Supplied | NA                                  |

Note:

1. The EUT is authorized for use in specific End-product. Please refer to below table for more details.

| Product                                  | Barcode Handy Terminal, 2D Code Handy Terminal |         |          |     |                   |     |     |                  |            |     |
|------------------------------------------|------------------------------------------------|---------|----------|-----|-------------------|-----|-----|------------------|------------|-----|
| Brand                                    | DENSO                                          |         |          |     |                   |     |     |                  |            |     |
| Model Name                               | Base module                                    | CPU     | Software | LCD | WLAN / WWAN / NFC |     |     |                  |            |     |
|                                          |                                                |         | OS       | 5"  | WLAN              | GPS | LTE | LTE Antenna type | Docomo IoT | NFC |
| BHT-1800QWBG-3<br>(FCC ID: PZWBHT1800QG) | 5inch WLAN/BT+LTE(USA)                         | MSM8909 | Android  | ○   | ○                 | ○   | ○   | USA              | ○          | ○   |
| BHT-1800QWB-3<br>(FCC ID: PZWBHT1800Q)   | 5inch WLAN/BT                                  | APQ8009 | Android  | ○   | ○                 |     |     |                  |            | ○   |

| Model Name                               | Audio   |          |         |          |           | Sensor               | Charge          | Reading |               |                |
|------------------------------------------|---------|----------|---------|----------|-----------|----------------------|-----------------|---------|---------------|----------------|
|                                          | Speaker | Main MIC | Sub MIC | Receiver | Ear phone | ALS/proximity sensor | Wireless charge | 2D      | Camera (rear) | Camera (front) |
| BHT-1800QWBG-3<br>(FCC ID: PZWBHT1800QG) | ○       | ○        | ○       | ○        | ○         | ○                    | ○               | ○       | ○             | ○              |
| BHT-1800QWB-3<br>(FCC ID: PZWBHT1800Q)   | ○       | ○        | ○       | ○        | ○         | ○                    | ○               | ○       | ○             | ○              |

\* Model: BHT-1800QWBG-3 was for final test.

2. The End-product consumes power from the following battery.

|                             |                            |
|-----------------------------|----------------------------|
| Battery (For BHT-1800 Used) |                            |
| Brand                       | DENSO                      |
| Model                       | BT-180LA                   |
| Rating                      | 2900mAh, 3.85Vdc, 11.165Wh |

3. The client provides the following cradles for tests. (Support unit only)

|                                               |                   |
|-----------------------------------------------|-------------------|
| LAN Cradle (For BHT-1800 Used) (Support unit) |                   |
| Brand                                         | DENSO             |
| Model                                         | CU-BL-18          |
| Output Power                                  | 12Vdc, 4.16A, 50W |

|                                               |                   |
|-----------------------------------------------|-------------------|
| USB Cradle (For BHT-1800 Used) (Support unit) |                   |
| Brand                                         | DENSO             |
| Model                                         | CU-BU1-18         |
| Output Power                                  | 12Vdc, 4.16A, 50W |

| Adapter for cradle (Support unit) |                                                            |
|-----------------------------------|------------------------------------------------------------|
| Brand                             | FSP GROUP INC.                                             |
| Model                             | FSP050-DBAE1                                               |
| Input Power                       | 100-240Vac, 1.5A, 50/60Hz                                  |
| Output Power                      | 12Vdc, 4.16A, 50W                                          |
| Power Line                        | 1.2m non-shielded DC cable with 1 core attached on adapter |

\*After pre-testing, USB cradle is the worst case for the final tests.

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

### 3.2 Description of Test Modes

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 |                    |
| A                  | -             | -   | -  | √  | Power from battery |
| B                  | √             | √   | √  | -  | Power from Cradle  |

Where RE: Radiated Emission  
FS: Frequency Stability

PLC: Power Line Conducted Emission  
EB: 20dB Bandwidth measurement

Note:

1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane**.
2. "-" means no effect.

#### 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 Configure Mode | Available Channel | Tested Channel | Modulation Type |
|--------------------|-------------------|----------------|-----------------|
| B                  | 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, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Type |
|--------------------|-------------------|----------------|-----------------|
| B                  | 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 Configure Mode | Available Channel | Tested Channel | Modulation Type |
|--------------------|-------------------|----------------|-----------------|
| B                  | 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 Configure Mode | Available Channel | Tested Channel | Modulation Type |
|--------------------|-------------------|----------------|-----------------|
| A                  | 1                 | 1              | ASK             |

#### Test Condition:

| Applicable to | Environmental Conditions | Input Power  | Tested by   |
|---------------|--------------------------|--------------|-------------|
| RE            | 25deg. C, 70%RH          | 120Vac, 60Hz | Noah Chang  |
| PLC           | 22deg. C, 66%RH          | 120Vac, 60Hz | Adair Peng  |
| FS            | 25deg. C, 70%RH          | 120Vac, 60Hz | Willy Cheng |
| BW            | 25deg. C, 70%RH          | 120Vac, 60Hz | Willy Cheng |

### 3.3 Description of Support Units

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

| ID | Product                                        | Brand          | Model No.      | Serial No. | FCC ID           | Remarks                  |
|----|------------------------------------------------|----------------|----------------|------------|------------------|--------------------------|
| A. | Notebook                                       | DELL           | E5430          | 2RL3YW1    | FCC DoC Approved | -                        |
| B. | Cradle                                         | DENSO          | CU-BU1-18      | NA         | NA               | Provided by manufacturer |
| C. | Adapter                                        | FSP GROUP INC. | FSP050-DBAE1   | NA         | NA               | Provided by manufacturer |
| D. | Barcode Handy Terminal, 2D Code Handy Terminal | DENSO          | BHT-1800QWBG-3 | NA         | PZWBHT1800Q      | Provided by manufacturer |

Note:

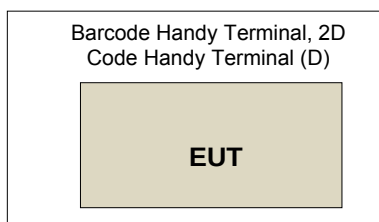
1. All power cords of the above support units are non-shielded (1.8m).

| ID | Descriptions | Qty. | Length (m) | Shielding (Yes/No) | Cores (Qty.) | Remarks                  |
|----|--------------|------|------------|--------------------|--------------|--------------------------|
| 1. | USB cable    | 1    | 0.5        | Y                  | 0            | -                        |
| 2. | DC cable     | 1    | 1.2        | N                  | 1            | Provided by manufacturer |

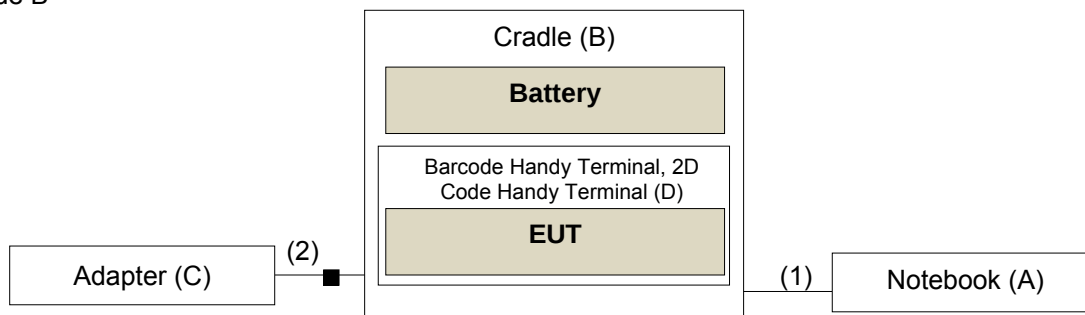
Note: The core(s) is(are) originally attached to the cable(s).

#### 3.3.1 Configuration of System under Test

Test Mode A



Test Mode B



### 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.

## 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              | ESCI                         | 100424                | Oct. 17, 2017 | Oct. 16, 2018 |
| Spectrum Analyzer<br>ROHDE & SCHWARZ          | FSP40                        | 100040                | Aug. 18, 2017 | Aug. 17, 2018 |
| BILOG Antenna<br>SCHWARZBECK                  | VULB9168                     | 9168-155              | Dec. 11, 2017 | Dec. 10, 2018 |
| HORN Antenna<br>SCHWARZBECK                   | BBHA 9120D                   | 9120D-1170            | Dec. 13, 2017 | Dec. 12, 2018 |
| HORN Antenna<br>SCHWARZBECK                   | BBHA 9170                    | BBHA9170241           | Dec. 01, 2017 | Nov. 30, 2018 |
| Loop Antenna<br>EMCI                          | EM-6879                      | 269                   | Aug. 11, 2017 | Aug. 10, 2018 |
| Preamplifier<br>Agilent (Below 1GHz)          | 8447D                        | 2944A10631            | Aug. 08, 2017 | Aug. 07, 2018 |
| RF signal cable<br>HUBER+SUHNER               | SUCOFLEX 104                 | MY 13380+295012/04    | Aug. 08, 2017 | Aug. 07, 2018 |
| RF signal cable<br>HUBER+SUHNER               | SUCOFLEX 104                 | Cable-CH4-03 (250724) | Aug. 08, 2017 | Aug. 07, 2018 |
| Software<br>BV ADT                            | ADT_Radiated_<br>V7.6.15.9.4 | NA                    | NA            | NA            |
| Antenna Tower<br>inn-co GmbH                  | MA 4000                      | 010303                | NA            | NA            |
| Antenna Tower Controller<br>BV ADT            | AT100                        | AT93021703            | NA            | NA            |
| Turn Table<br>BV ADT                          | TT100                        | TT93021703            | NA            | NA            |
| Turn Table Controller<br>BV ADT               | SC100                        | SC93021703            | NA            | NA            |
| High Speed Peak Power<br>Meter                | ML2495A                      | 0824012               | Aug. 18, 2017 | Aug. 17, 2018 |
| Power Sensor                                  | MA2411B                      | 0738171               | Aug. 18, 2017 | Aug. 17, 2018 |
| DC Power Supply<br>Topward                    | 6306A                        | 727263                | NA            | NA            |
| Temperature And Humidity<br>Chamber<br>TERCHY | HM-120RF                     | 931022                | Nov. 20 2017  | Nov. 19, 2018 |

- Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 4.
3. The FCC Designation Number is TW0003. The number will be varied with the Lab location and scope as attached.
4. The IC Site Registration No. is IC 7450F-4.

#### 4.1.3 Test Procedures

##### For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

**Note:**

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

##### For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

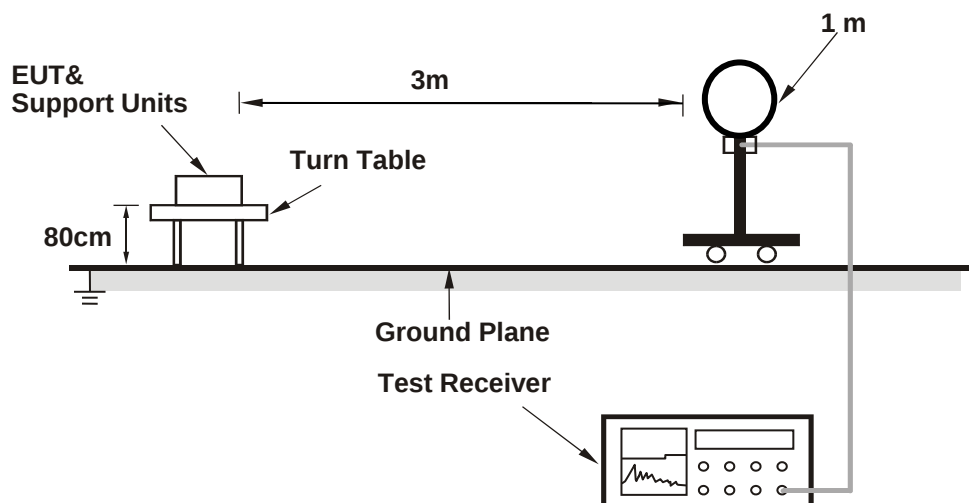
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

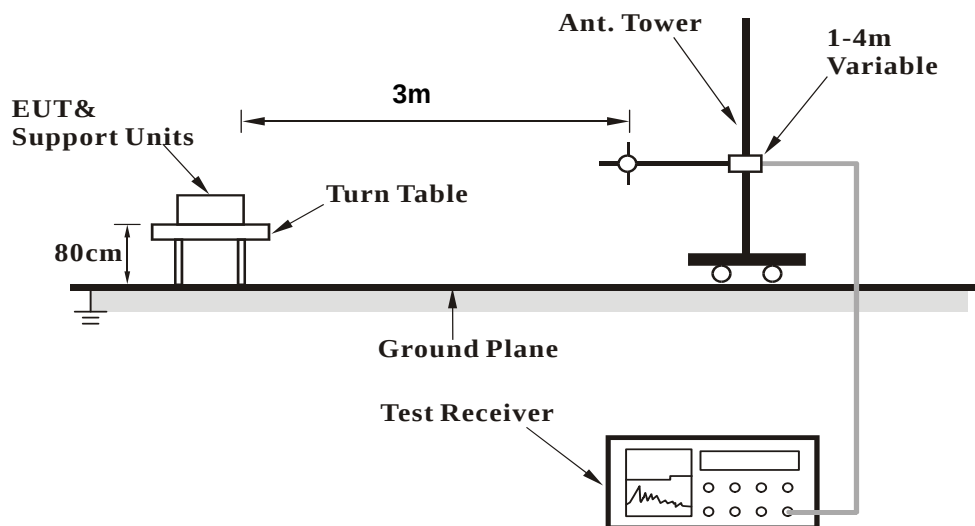
No deviation.

#### 4.1.5 Test Set Up

##### For Radiated emission below 30MHz



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



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

#### 4.1.6 EUT Operating Conditions

##### Test Mode A

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

##### Test Mode B

- a. Set the EUT plugged in the cradle and connected with a notebook system via a USB cable and placed on a testing table.
- b. The notebook system ran a test program (provided by manufacturer) to enable 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 | 25 deg. C, 70% RH | Tested By          | Noah 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      | 56.9 QP                 | 124.00 QP      | -67.1       | 1.00               | 177                  | 36.4             | 20.5                     |

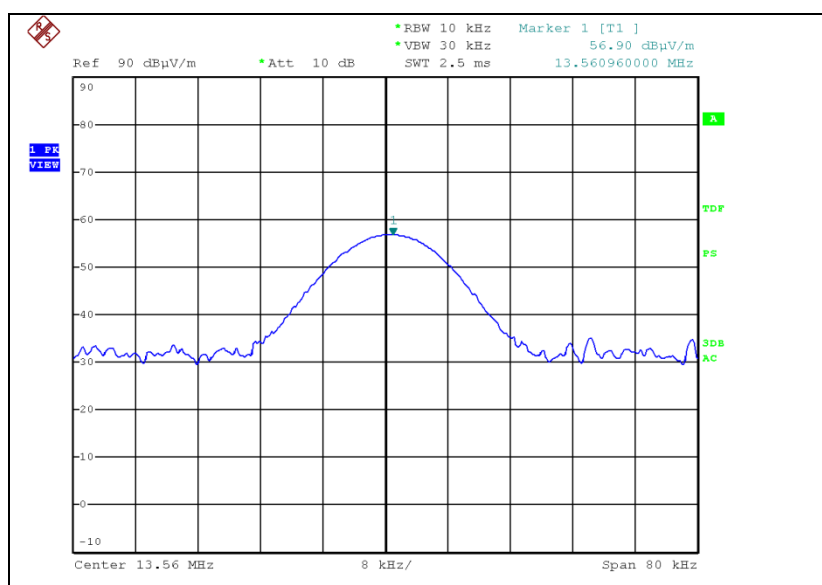
Remarks:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
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 | 25 deg. C, 70% RH | Tested By          | Noah 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      | 54.1 QP                 | 124.00 QP      | -69.9       | 1.00               | 45                   | 33.6             | 20.5                     |

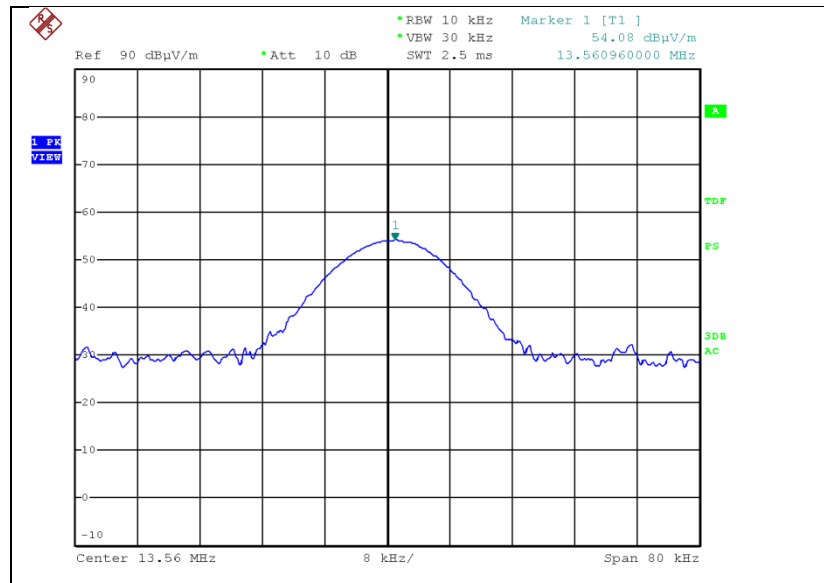
Remarks:

1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
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:

13.56MHz = 15848uV/m                      30m  
               = 84dBuV/m                      30m  
               =  $84+20\log(30/3)^2$               3m  
               = 124dBuV/m



| EUT Test Condition       |                   | Measurement Detail |                    |
|--------------------------|-------------------|--------------------|--------------------|
| Channel                  | Channel 1         | Frequency Range    | 13.553 ~ 13.567MHz |
| Input Power              | 120Vac, 60Hz      | Detector Function  | Quasi-Peak         |
| Environmental Conditions | 25 deg. C, 70% RH | Tested By          | Luis Lee           |

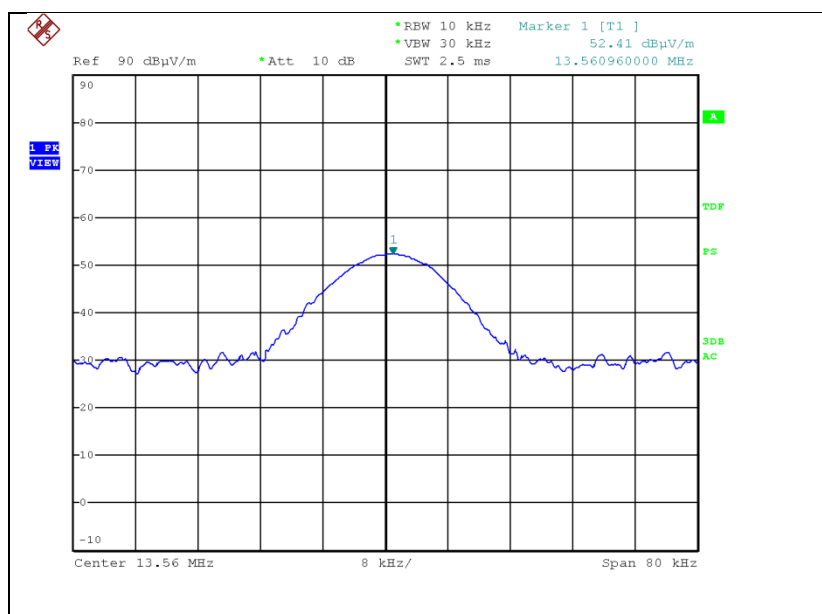
| Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel At 3m |             |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 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      | 52.4 QP                 | 124.0 QP       | -71.6       | 1.00               | 315                  | 31.9             | 20.5                     |

- 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)
  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:

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

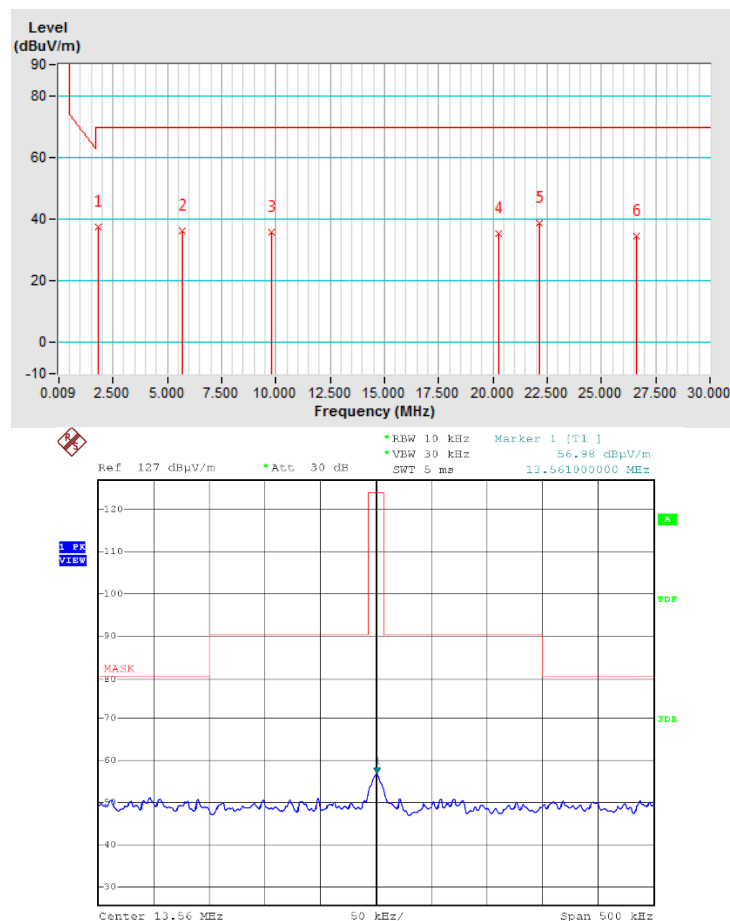


| EUT Test Condition       |                   | Measurement Detail |             |
|--------------------------|-------------------|--------------------|-------------|
| Channel                  | Channel 1         | Frequency Range    | Below 30MHz |
| Input Power              | 120Vac, 60Hz      | Detector Function  | Quasi-Peak  |
| Environmental Conditions | 25 deg. C, 70% RH | Tested By          | Noah 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                                                         | 1.81        | 37.4 QP                 | 69.5           | -32.1       | 1.00               | 213                  | 17.1             | 20.3                     |
| 2                                                         | 5.71        | 36.1 QP                 | 69.5           | -33.4       | 1.00               | 276                  | 15.6             | 20.5                     |
| 3                                                         | 9.79        | 35.7 QP                 | 69.5           | -33.8       | 1.00               | 190                  | 15.2             | 20.5                     |
| 4                                                         | 20.28       | 35.5 QP                 | 69.5           | -34.0       | 1.00               | 231                  | 15.1             | 20.4                     |
| 5                                                         | 22.14       | 38.8 QP                 | 69.5           | -30.7       | 1.00               | 221                  | 18.3             | 20.5                     |
| 6                                                         | 26.64       | 34.5 QP                 | 69.5           | -35.0       | 1.00               | 231                  | 13.8             | 20.7                     |

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

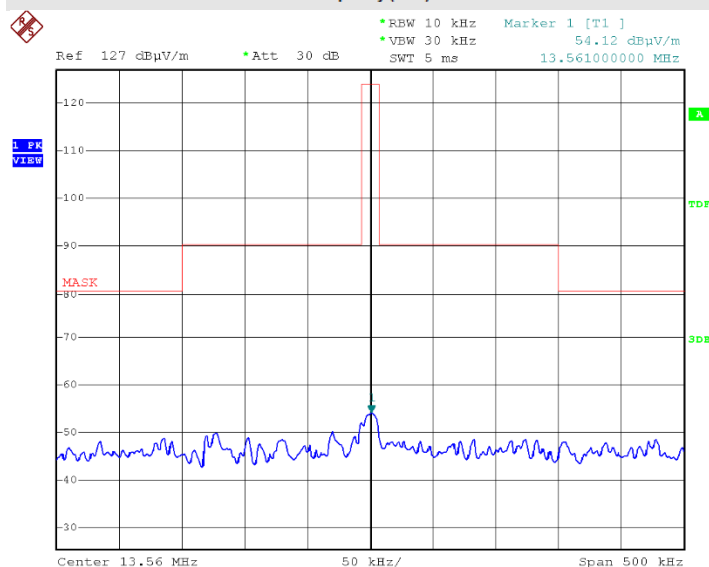
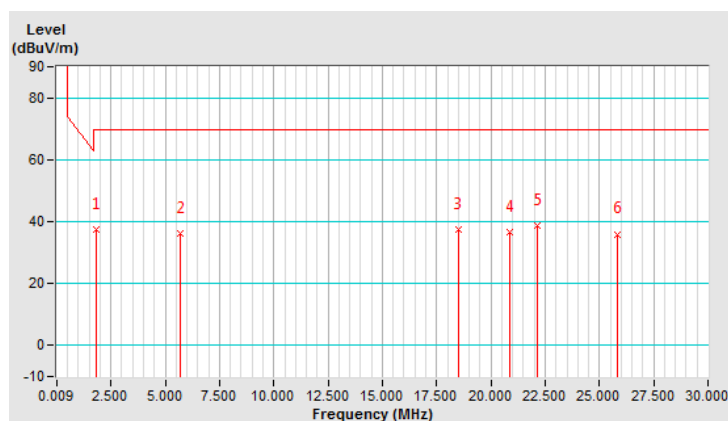


| EUT Test Condition       |                   | Measurement Detail |             |
|--------------------------|-------------------|--------------------|-------------|
| Channel                  | Channel 1         | Frequency Range    | Below 30MHz |
| Input Power              | 120Vac, 60Hz      | Detector Function  | Quasi-Peak  |
| Environmental Conditions | 25 deg. C, 70% RH | Tested By          | Noah 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                                                          | 1.81        | 37.4 QP                 | 69.5           | -32.1       | 1.00               | 213                  | 17.1             | 20.3                     |
| 2                                                          | 5.71        | 36.1 QP                 | 69.5           | -33.4       | 1.00               | 276                  | 15.6             | 20.5                     |
| 3                                                          | 18.48       | 37.5 QP                 | 69.5           | -32.0       | 1.00               | 279                  | 17.0             | 20.5                     |
| 4                                                          | 20.88       | 36.4 QP                 | 69.5           | -33.1       | 1.00               | 356                  | 16.0             | 20.4                     |
| 5                                                          | 22.14       | 38.8 QP                 | 69.5           | -30.7       | 1.00               | 221                  | 18.3             | 20.5                     |
| 6                                                          | 25.80       | 36.0 QP                 | 69.5           | -33.5       | 1.00               | 9                    | 15.3             | 20.7                     |

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)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

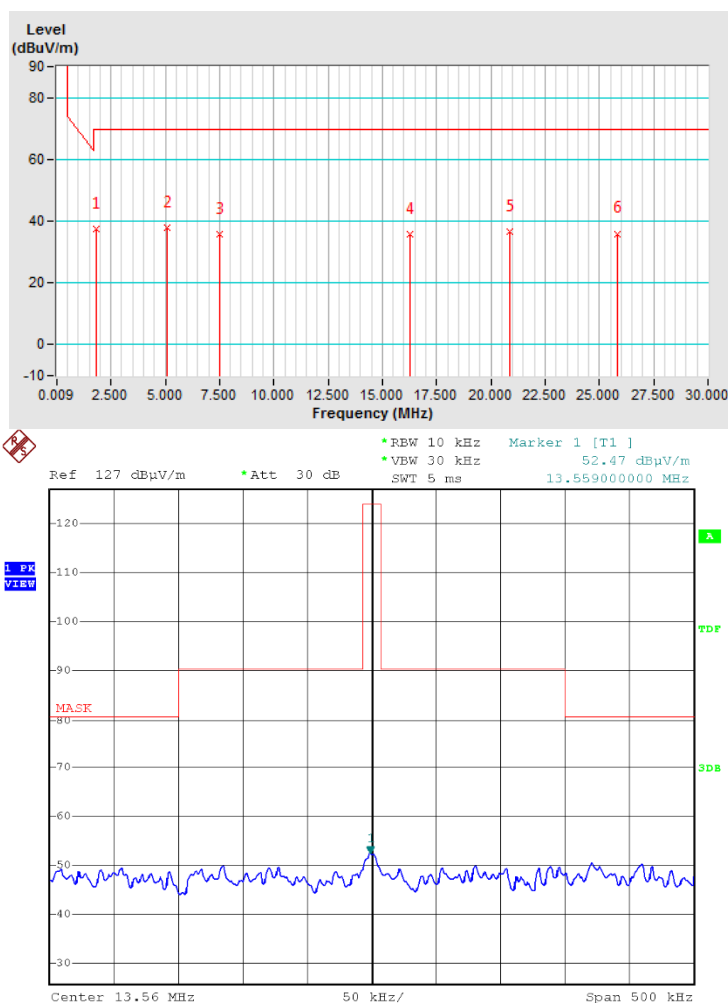


| EUT Test Condition       |                   | Measurement Detail |             |
|--------------------------|-------------------|--------------------|-------------|
| Channel                  | Channel 1         | Frequency Range    | Below 30MHz |
| Input Power              | 120Vac, 60Hz      | Detector Function  | Quasi-Peak  |
| Environmental Conditions | 25 deg. C, 70% RH | Tested By          | Noah Chang  |

| Antenna Polarity & Test Distance: Loop Antenna Ground-Parallel 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                                                                    | 1.81        | 37.4 QP                 | 69.5           | -32.1       | 1.00               | 213                  | 17.1             | 20.3                     |
| 2                                                                    | 5.11        | 37.8 QP                 | 69.5           | -31.7       | 1.00               | 16                   | 17.3             | 20.5                     |
| 3                                                                    | 7.51        | 35.8 QP                 | 69.5           | -33.7       | 1.00               | 162                  | 15.4             | 20.4                     |
| 4                                                                    | 16.26       | 35.8 QP                 | 69.5           | -33.7       | 1.00               | 5                    | 15.2             | 20.6                     |
| 5                                                                    | 20.88       | 36.4 QP                 | 69.5           | -33.1       | 1.00               | 356                  | 16.0             | 20.4                     |
| 6                                                                    | 25.80       | 36.0 QP                 | 69.5           | -33.5       | 1.00               | 9                    | 15.3             | 20.7                     |

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)
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 | 25 deg. C, 70% RH | Tested By          | Noah 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                                                  | 43.48       | 22.2 QP                 | 40.0           | -17.8       | 1.50 H             | 223                  | 36.6             | -14.4                    |
| 2                                                  | 305.44      | 21.2 QP                 | 46.0           | -24.8       | 1.50 H             | 103                  | 33.3             | -12.1                    |
| 3                                                  | 511.12      | 20.4 QP                 | 46.0           | -25.6       | 1.00 H             | 252                  | 28.6             | -8.2                     |
| 4                                                  | 749.79      | 26.9 QP                 | 46.0           | -19.1       | 1.00 H             | 220                  | 29.6             | -2.7                     |
| 5                                                  | 802.18      | 27.2 QP                 | 46.0           | -18.8       | 1.00 H             | 7                    | 28.8             | -1.6                     |
| 6                                                  | 951.59      | 32.3 QP                 | 46.0           | -13.7       | 2.00 H             | 315                  | 31.3             | 1.0                      |
| 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) |
| 1                                                  | 74.53       | 17.4 QP                 | 40.0           | -22.6       | 1.50 V             | 184                  | 33.8             | -16.4                    |
| 2                                                  | 132.74      | 26.9 QP                 | 43.5           | -16.6       | 1.00 V             | 188                  | 41.9             | -15.0                    |
| 3                                                  | 313.20      | 25.0 QP                 | 46.0           | -21.0       | 1.50 V             | 88                   | 36.7             | -11.7                    |
| 4                                                  | 404.40      | 22.7 QP                 | 46.0           | -23.3       | 1.00 V             | 180                  | 33.0             | -10.3                    |
| 5                                                  | 579.03      | 23.3 QP                 | 46.0           | -22.7       | 1.50 V             | 21                   | 29.9             | -6.6                     |
| 6                                                  | 747.85      | 32.9 QP                 | 46.0           | -13.1       | 1.00 V             | 12                   | 35.6             | -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)
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

Test Date: Jul. 19, 2018

| Description & Manufacturer               | Model No.                | Serial No.     | Cal. Date     | Cal. Due      |
|------------------------------------------|--------------------------|----------------|---------------|---------------|
| Test Receiver<br>ROHDE & SCHWARZ         | ESCI                     | 100613         | Nov. 23, 2017 | Nov. 22, 2018 |
| RF signal cable (with 10dB PAD)<br>Woken | 5D-FB                    | Cable-cond1-01 | Sep. 05, 2017 | Sep. 04, 2018 |
| LISN<br>ROHDE & SCHWARZ<br>(EUT)         | ENV216                   | 101826         | Feb. 26, 2018 | Feb. 25, 2019 |
| LISN<br>ROHDE & SCHWARZ<br>(Peripheral)  | ESH3-Z5                  | 100311         | Aug. 15, 2017 | Aug. 14, 2018 |
| Software<br>ADT                          | BV ADT_Cond_<br>V7.3.7.4 | 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

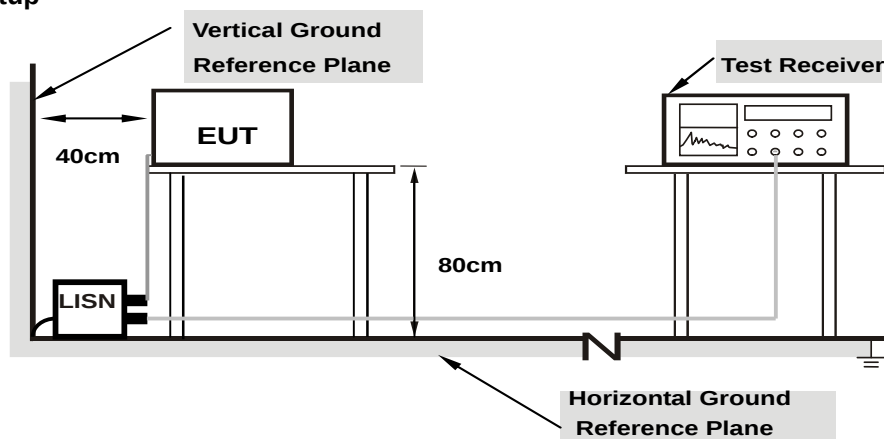
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

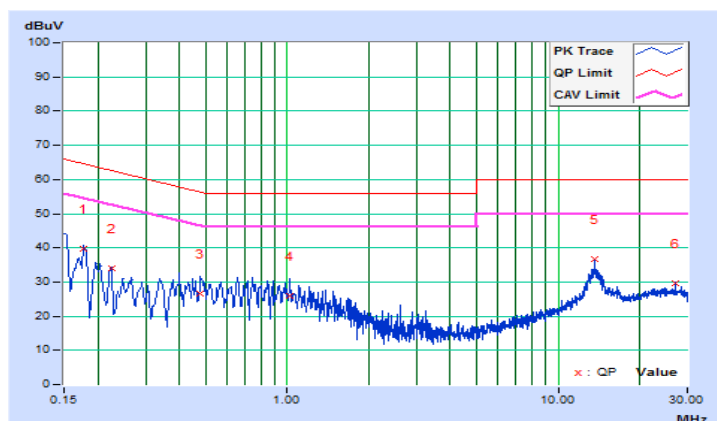
#### 4.2.7 Test Results

| 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        | 0.17744         | 10.10                   | 29.56                      | 17.43        | 39.66                       | 27.53        | 64.60              | 54.60        | -24.94         | -27.07        |
| 2        | 0.22434         | 10.10                   | 23.95                      | 12.22        | 34.05                       | 22.32        | 62.66              | 52.66        | -28.61         | -30.34        |
| 3        | 0.47844         | 10.11                   | 16.62                      | 6.79         | 26.73                       | 16.90        | 56.37              | 46.37        | -29.64         | -29.47        |
| 4        | 1.02584         | 10.13                   | 15.82                      | 6.17         | 25.95                       | 16.30        | 56.00              | 46.00        | -30.05         | -29.70        |
| <b>5</b> | <b>13.56130</b> | <b>10.84</b>            | <b>25.99</b>               | <b>23.68</b> | <b>36.83</b>                | <b>34.52</b> | <b>60.00</b>       | <b>50.00</b> | <b>-23.17</b>  | <b>-15.48</b> |
| 6        | 27.12118        | 11.53                   | 17.95                      | 14.77        | 29.48                       | 26.30        | 60.00              | 50.00        | -30.52         | -23.70        |

#### 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.

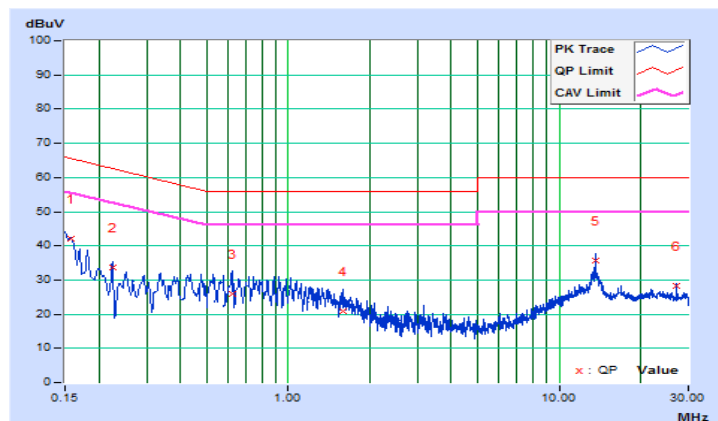


|       |             |                   |                                |
|-------|-------------|-------------------|--------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|-------|-------------|-------------------|--------------------------------|

| 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  | 0.15719        | 10.09                   | 32.10                      | 21.19 | 42.19                       | 31.28 | 65.61              | 55.61 | -23.42         | -24.33 |
| 2  | 0.22429        | 10.10                   | 23.59                      | 11.21 | 33.69                       | 21.31 | 62.66              | 52.66 | -28.97         | -31.35 |
| 3  | 0.61920        | 10.12                   | 15.67                      | 3.11  | 25.79                       | 13.23 | 56.00              | 46.00 | -30.21         | -32.77 |
| 4  | 1.58485        | 10.16                   | 10.82                      | 4.26  | 20.98                       | 14.42 | 56.00              | 46.00 | -35.02         | -31.58 |
| 5  | 13.56130       | 10.70                   | 25.14                      | 23.22 | 35.84                       | 33.92 | 60.00              | 50.00 | -24.16         | -16.08 |
| 6  | 27.12118       | 11.18                   | 16.99                      | 14.53 | 28.17                       | 25.71 | 60.00              | 50.00 | -31.83         | -24.29 |

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.

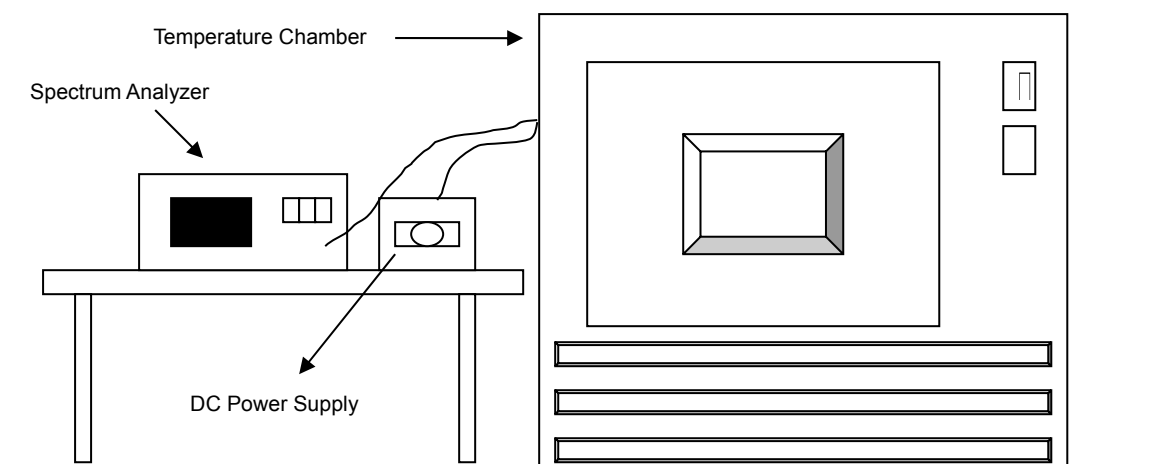


### 4.3 Frequency Stability

#### 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>(Vdc) | 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                               | 3.85                     | 13.56007              | 0.00052            | 13.56007              | 0.00052            | 13.56006              | 0.00044            | 13.56007              | 0.00052            |
| 40                               | 3.85                     | 13.55996              | -0.00029           | 13.55996              | -0.00029           | 13.55996              | -0.00029           | 13.55996              | -0.00029           |
| 30                               | 3.85                     | 13.56001              | 0.00007            | 13.56002              | 0.00015            | 13.56001              | 0.00007            | 13.56001              | 0.00007            |
| 20                               | 3.85                     | 13.55997              | -0.00022           | 13.55996              | -0.00029           | 13.55997              | -0.00022           | 13.55996              | -0.00029           |
| 10                               | 3.85                     | 13.55995              | -0.00037           | 13.55994              | -0.00044           | 13.55995              | -0.00037           | 13.55995              | -0.00037           |
| 0                                | 3.85                     | 13.56006              | 0.00044            | 13.56006              | 0.00044            | 13.56005              | 0.00037            | 13.56006              | 0.00044            |
| -10                              | 3.85                     | 13.56005              | 0.00037            | 13.56005              | 0.00037            | 13.56006              | 0.00044            | 13.56005              | 0.00037            |
| -20                              | 3.85                     | 13.56003              | 0.00022            | 13.56004              | 0.00029            | 13.56003              | 0.00022            | 13.56004              | 0.00029            |

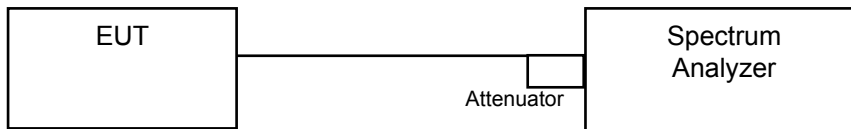
| Frequency Stability Versus Voltage |                          |                       |                    |                       |                    |                       |                    |                       |                    |
|------------------------------------|--------------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| TEMP.<br>(°C)                      | Power<br>Supply<br>(Vdc) | 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                                 | 4.4275                   | 13.55997              | -0.00022           | 13.55996              | -0.00029           | 13.55997              | -0.00022           | 13.55996              | -0.00029           |
|                                    | 3.85                     | 13.55997              | -0.00022           | 13.55996              | -0.00029           | 13.55997              | -0.00022           | 13.55996              | -0.00029           |
|                                    | 3.2725                   | 13.55997              | -0.00022           | 13.55996              | -0.00029           | 13.55997              | -0.00022           | 13.55996              | -0.00029           |

#### 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



##### 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

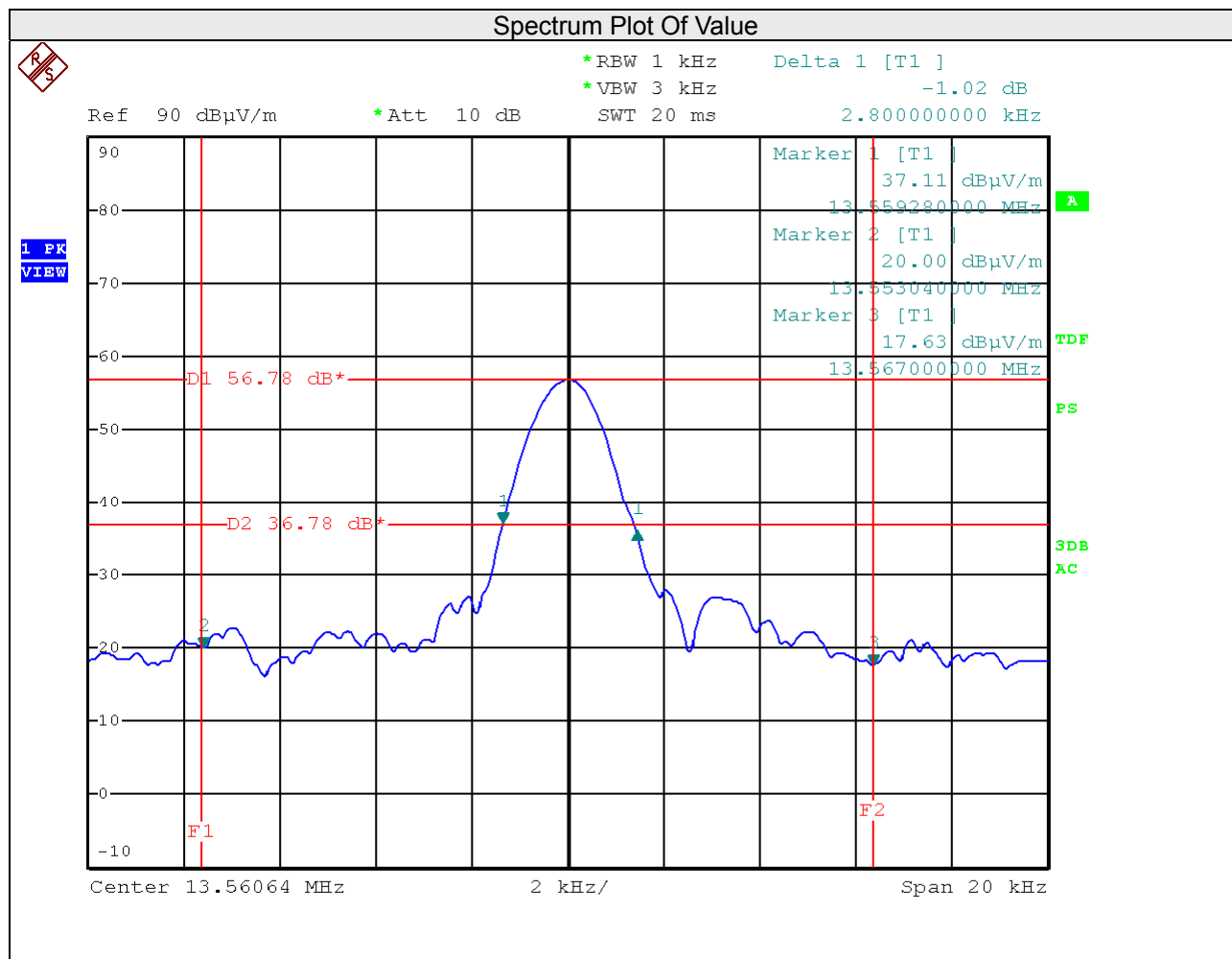
No deviation.

##### 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          | 13.56208           | 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.

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

**Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

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

Tel: 886-3-6668565

Fax: 886-3-6668323

**Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232

Fax: 886-3-3270892

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

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

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

--- END ---